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ABSTRACT

In this study of current and potential users of teleconferencing media in post-high school settings, more than 50 teleconferencing systems in the United States and Canada were surveyed. Researchers examined instructional, administrative, student service, and interorganizational uses of teleconferencing in educational organizations ranging from university extensions and professional associations to community volunteer organizations. The report includes detailed case studies of 13 existing systems and a comparative analysis of the characteristics of 46 educational networks. Having explored future uses of these media in light of likely societal trends, the Institute's judgment is that the use of teleconferencing in postsecondary education will continue to increase, but at a rate much slower than that predicted for earlier educational technologies. The most promising possibilities are in specific areas of instruction, such as courses that meet requirements for professional recertification. The operational guidelines provided include a set of preconditions or prerequisites for implementation of a teleconferencing system to facilitate the start-up process and to identify areas where teleconferencing does not seem appropriate, as well as guidelines for effective usage once a system has been established. (Author/RAO)

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ELECTRONIC EDUCATION:

USING TELECONFERENCING IN POSTSECONDARY ORGANIZATIONS

Robert Johansen

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Electronic Education:
Using Teleconferencing in Postsecondary Organizations

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Our project monitor at Exxon Education Foundation was Robert J. McLaughlin; we thank both him and his colleagues for their support and encouragement.

Preface

The focus of this study is the current and potential uses of teleconferencing media in postsecondary education. Since "teleconferencing" and "postsecondary education" mean different things to different people, it is important to begin with basic definitions of those terms. Our definition of "postsecondary education" is intentionally broad: any learning environment beyond the high school level--formal or informal, credit or noncredit. In addition to instruction and training, we include the various administrative and organizational processes that are complementary to teaching and learning. We include not only colleges and universities, but also corporations, professional associations, or other organizations that provide postsecondary education.

By "teleconferencing," we mean interactive group communication through an electronic medium. The key to our definition is *interaction:* communication is two-way, rather than "broadcast," allowing interpersonal exchanges. Teleconferencing enables three or more people to interact through an electronic medium that carries audio, video, or text signals--or combinations of them. The basic types of teleconferencing now in use are as follows:

Audio teleconferencing This medium allows group communication by sound only. It is a logical extension of the telephone, with special terminal equipment that replaces the handset to provide "hands-free" usage. The transmission circuits often provide better sound quality than normal telephones. Some systems provide means for identifying the various participants when they speak or for indicating when someone wishes to speak. Audio is the most commonly used teleconferencing medium in postsecondary education today; it is also the least expensive.

Video teleconferencing In a video teleconference, television-like visual signals are complemented by audio information. As might be expected, video teleconferencing is very expensive--at least five times

audio costs. A well-designed video teleconference requires careful planning, elaborate equipment, and special transmission facilities to send the video signals. At present, video teleconferencing is rarely used in postsecondary education.[1]

Computer-based teleconferencing Computers can be used to exchange textual information, as entered by participants through typewriter-like computer terminals. Participants can join a teleconference, see the entries that have been made since they were last present, make their own comments, and leave. Or a whole group can be "present" simultaneously. Computers have been used considerably in individualized instruction. Yet group communication through this medium, usually called "computer conferencing," has only received limited attention within educational environments.

Media mixes A media mix is a hybrid of two or more communications technologies. The use of additional media to supplement audio teleconferencing is widespread among the systems covered by our survey. The most common method has been to augment the teleconferencing programming with conventional educational materials such as texts, slides, and supplemental printed handouts of materials pertinent to the course content. In some instances, it is possible for instructors in the central classroom to change slides on view at other sites via remote control. Video cassettes and audio tapes are employed to facilitate teleconference programming, and lectures are often recorded in advance for remote users in the teleconferencing network. Perhaps the most readily available media mix for most educational settings is a remote writing or telecopying device that can send printed pages or diagrams, or allow for a common writing space during the actual teleconference.[2]

These teleconferencing media seem capable of electronically bridging a number of communication barriers. Students who are very busy (working parents, for example) could "attend" seminars at flexible hours by using their own telephone or going to a neighborhood teleconferencing center. Rural residents could enroll in courses taught by faculty hundreds of miles away. Students who are homebound or physically handicapped could have better access to quality educational services.

Such applications of teleconferencing can be found today. However, the use of teleconferencing in postsecondary education is limited at present, and its potentials and limitations are only beginning to be understood. Comprehensive information about current attempts to provide teleconferencing in postsecondary education is often difficult to obtain. Also, advocates of teleconferencing have frequently been accused of overstating the virtues of these media. Our intent in this study was to examine existing teleconferencing systems, exploring the advantages and limitations of these media in various educational settings.

The first step of our project was to identify and contact by telephone about 75 organizations who had direct experience with teleconferencing. We used a questionnaire to request initial information about their activities and followed up with further telephone interviews and personal visits as necessary. A full description of the project methodology, including a list of questions used with each participating organization, is contained in the Appendix.

From this initial analysis of current teleconferencing activities, we identified 13 systems that could be viewed as prototypes worthy of more detailed study. Capsule descriptions of the prototype systems and a discussion of how they were chosen are contained in the section "A Closer Look at Systems." We paid special attention to identifying common characteristics and unique features in current uses of teleconferencing in postsecondary education that might offer insight into both problems and potentials associated with these media.

This report should be of particular interest to those considering implementation of teleconferencing media in postsecondary education or expansion of their existing system. Our goal is to provide a basis for informed judgment regarding the strengths and weaknesses of teleconferencing and to offer useful guidelines for effective future use of these media in postsecondary education.

NOTES

1. There are educational systems that broadcast video lectures and allow telephone questions from students. Systems of this type are in use at Stanford University, University of Southern California, and Illinois Institute of Technology, for example. Although this usage is certainly effective in many instances, our goal was to examine interactive *group* communication through electronic media. Therefore, we have decided somewhat arbitrarily not to include such systems in this study. While broadcast systems have frequently been studied before, interactive media such as teleconferencing have rarely been examined in educational settings.

2. The University of Wisconsin-Extension has already made heavy use of audio teleconferencing combined with the capability to send writing over telephone lines via the Victor Electrowriter. See Lowell B. Jackson, "SEEN--A Case Study of Engineering Education by Wire," *The Status of the Telephone in Education*, University of Wisconsin-Extension, Madison, Wisconsin, 1977. The University of Illinois has experimented with a similar graphics device, the "electronic blackboard" (marketed by AT&T as Gemini II) for teaching graduate engineering courses. See Jim Seyler, "Electronic Blackboard Permits Graduate Engineering Course Offerings to Engineers in Industry," *1976 College Industry Education Conference Proceedings*. The "tele-board" system is another example of a system for transmitting written information. See *The Use of the Teleboard in Friesland*, Information Transmission Laboratory, Department of Electrical Engineering, DELFT University of Technology, Mekelweg 4, Delft, The Netherlands. A "multiscribophony" system has also been developed in The Netherlands to send mixes of graphics and voice media over a single television channel. See P. B. Hesdahl, "Realization of a Multiscribophony System," *Journal of Applied Science and Engineering*, 1975, pp. 229-35. Bell Canada is developing a system called "scribblephone," which would provide graphics and voice capabilities, as well as a link to computers.

Chapter One
Teleconferencing: An Intermediate Technology?

In times of tight funding in the world of education, critics view any new educational technologies skeptically. "Here we go again," they claim, often citing horror stories of overselling or underuse of previous innovations. Educators' varied expectations of new technologies have had a major influence on how these technologies have been used in educational settings. Teleconferencing, too, will be shaped by the expectations of the world of education, as well as by its own inherent characteristics.

Skepticism toward educational technology is now quite common in the United States, following an era when technology was frequently heralded as an answer (sometimes *the* answer) to pressing problems in the educational system. The hopes for educational technology in the 1950s and early 1960s were giant hopes. Television, for instance, was envisioned as a massive distribution system for educational information. Computers were quickly expected to provide individualized learning, with more flexibility and at lower cost than conventional methods. Space-race expectations prevailed, with little sympathy for cautious innovation or long transition periods. Educational technologies were part of a burst of novelty, including New Math, open classrooms, and a host of other dramatic proposals for reform. Bernard Friedlander, looking back from the mid-1970s and looking forward to the future of instructional television, offered the following appraisal:

> The pattern was the same for all of these innovations. One set of people came to the conclusion that it would be a good idea for another set of people to do things differently than they had ever done before. Then the first set of people, who had the influence and authority, tried to get the second set of people to do what was wanted, almost invariably without regard for the true complexities of the intended change. In almost every case, the confrontation between innovation and regularity produced an initial flurry, after which things settled back to a minor modification of prior practice. At best, the results were an equivalent of "just as good." At worst, the results were a dismal failure--that often took years to recognize as such.[1]

In the 1950s and 1960s, the funding climate in the United States was conducive to large-scale innovations. The shortage of qualified teachers called for new ways to meet the needs of a dramatically expanding student populace spawned by the college enrollment of the baby-boom cohort. The desire to "catch-up" in the space/technology race with the Soviet Union produced Sputnik-inspired expansion of science education. Also, the war on poverty in the mid-1960s put great pressure on the educational establishment to provide effective learning experiences for disadvantaged students. The dominant model of education was information transmission, from teachers to students. Technologies that promised efficiency and mass delivery fit that model well.[2] Certainly these expectations of educational technology were shaped in large part by the mood of the times.

It is not our purpose here to trace the history of educational technologies, nor to pass judgment on certain efforts as "successes" or "failures." Of course, there is serious debate and conflicting data regarding whether or not educational technologies have "failed." But however one evaluates the history of educational technologies, it is justifiable to ask how teleconferencing compares to past efforts. Such a comparison provides a foundation for examining the current and potential uses of teleconferencing in postsecondary education. While many will perceive teleconferencing as belonging to the same family of innovations as educational television or computer-assisted learning, there are significant differences in both the technologies and the expectations placed on them.

Teleconferencing is maturing in a period that is quite different from that of the 1950s and 1960s. Educational funding is more constrained now, with strong pressures to justify any expenditures--particularly new expenditures. Public reverance for technology-driven solutions is also waning.[3] There is more pressure to examine the potential impacts of a technology, even before the technology is introduced. (Note the requirements for environmental or social impact reports.)

The concept of "intermediate technology" that has emerged within the last few years is an important aspect of the social climate in which teleconferencing is being introduced. Intermediate technology articulates an alternative to large-scale complex images of what technology should be.

In so doing, it widens the range of alternative possibilities for using any technology and suggests an array of images for future uses of teleconferencing that seem more closely aligned to the notion of intermediate technology than to the large-scale experimentation with educational technologies in earlier periods.

As advocated by the late E. F. Schumacher and others, intermediate technology is technology directly matched to the needs it is intended to fulfill. (In fact, "appropriate" technology is an alternative designation that is perhaps more accurate than "intermediate" technology.) Schumacher's perspective was largely a response to technological overkill, where complex, large-scale technologies were used to perform essentially simple functions. Certainly there is a place for large-scale efforts, but Schumacher argues that the industrialized world has lost sight of the virtues of small-scale technologies and has indiscriminantly applied more technology than necessary in most situations.[4]

Intermediate technologies have characteristics such as these:

- They are workable on a small scale.
- They are simple to operate and repair, thus encouraging user skills and creativity.
- They can make efficient use of existing resources.
- They are accessible to users.
- Their cost is low to moderate.
- They encourage decentralized control.

In the field of education, the concept of intermediate technology is useful in examining varied ways in which teleconferencing media can be used. Even complex technologies have the potential to be used in ways that are certainly akin to intermediate technologies. For instance, portable, low-cost television cameras and videotape recorders have created the opportunity for small-scale educational television that can operate on a low budget. Minicomputers are creating similar opportunities for "intermediate" educational applications on a more modest scale than the massive visions of earlier days. These examples demonstrate that the use of

technologies is less dependent upon the nature of the media themselves than upon the orientation of those implementing them. To provide an initial perspective on what teleconferencing is and what it might become, each of the characteristics of intermediate technologies mentioned above can be examined in terms of its relevance to teleconferencing.

- Scale The scale of teleconferencing systems in postsecondary education can vary broadly, from simple conference telephone calls to large, specially designed networks with thousands of users. There is no apparent need to have a system of some minimal size in order to make teleconferencing feasible.

- Complexity Teleconferencing can also vary broadly in its complexity. Simple systems are certainly possible, but so are ones that use highly complex technologies such as full-motion video or large computers. Audio-only systems are the least complex, though even here there is a range of possible options that can achieve the desired level of sound quality.[5] Also, the "simple" systems often rely on the highly complex telephone network already in place in the United States. Addition of other capabilities (e.g., facsimile, telewriting, visuals) certainly increases the complexity of the system. Reapir of simple systems is usually possible with minimal skills, but becomes increasingly difficult with more complex systems.

  Teleconferencing media only provide connections among people; they do not provide content. Thus, the users must develop their own teaching and learning skills to take advantage of the media. While it is usually easy to learn to operate teleconferencing equipment, it is more difficult to develop the craft of communication via these media.

- Relation to existing technologies Most forms of teleconferencing build directly on existing technologies. Audio teleconferencing typically uses the telephone network; computer-based teleconferencing simply adds a new use to existing computer networks. Teleconferencing does not usually consume new resources in either the development or application stages. In fact, the core technologies used in teleconferencing have been around for up to 30 years.[6]

- Accessibility Users of teleconferencing can have easy access to the media, at least in industrialized countries. (This is a considerable caveat since the concept of intermediate technology is usually applied in the context of developing countries.) Home telephones can be used, or local centers established, for small-group meetings joined to other locations via teleconference. Of course, encouraging participants to go to a central location may be difficult; both physical and psychological distance could prove important to users' perceptions of a medium as accessible to them. (For instance, a teleconferencing room in the next building--but on the premises of a separate department--may seem far away.) More complex systems may also be less accessible, since the expense of the facilities is likely to limit the number of locations.

  Accessibility of information about educational teleconferencing has been quite limited. There is little published material and only a small number of organizations are known to be using teleconferencing. The University of Wisconsin-Extension has organized several conferences (face-to-face) on teleconferencing and has made information about its activities broadly available. The *Telecoms Newsletter*[7] is the only ongoing publication specifically devoted to the use of teleconferencing in postsecondary education.

- Cost The costs of teleconferencing will be explored in more detail in Chapter Three. At this point, it is important only to recognize that the costs of teleconferencing increase (though usually not proportionately) with complexity of equipment and scale of operation. It is possible, however, to have inexpensive or moderately priced teleconferencing, according to most standards.

- Effects on centralization Teleconferencing is often presented as a medium that encourages decentralization and diversity; this *can* be the case. Teleconference connections among branch campuses, for instance, would facilitate the development of more localized control at the branch facilities. One could also imagine how students might use teleconferencing to initiate changes in the educational process, rather than relying on a central faculty. However, teleconferencing

could also be used to increase centralization of control by providing a mechanism for monitoring remote locations on a regular basis and making it possible for a central body to administer to a much more widely dispersed audience. Thus, teleconferencing itself might be used either to promote decentralization or centralization; there is no clear evidence that it is inherently oriented toward either.

It is clear from the above analysis that teleconferencing does have a number of characteristics consistent with the concept of intermediate technology. Small-scale usage, simplicity, efficient use of existing resources, accessibility, low-cost, and decentralization are all *possible* in a teleconferencing system. These characteristics help to explain its emerging role in the more cautious climate of the 1970s. Teleconferencing is in some sense an exception to the apparent tendency in educational technology toward increasingly more sophisticated systems. Teleconferencing does not appear to be ruled by the restatement of Gresham's Law that: "The simple mechanism is displaced by the complex one, and the more expensive displaces the less expensive."[8] The emphasis in the uses of teleconferencing in postsecondary education is on electronic meetings, usually involving small groups of people. Teleconferencing, which focuses on group interaction, potentially opens up a wide range of options in learning modes that emphasize greater student participation and responsibility in the teaching-learning process.

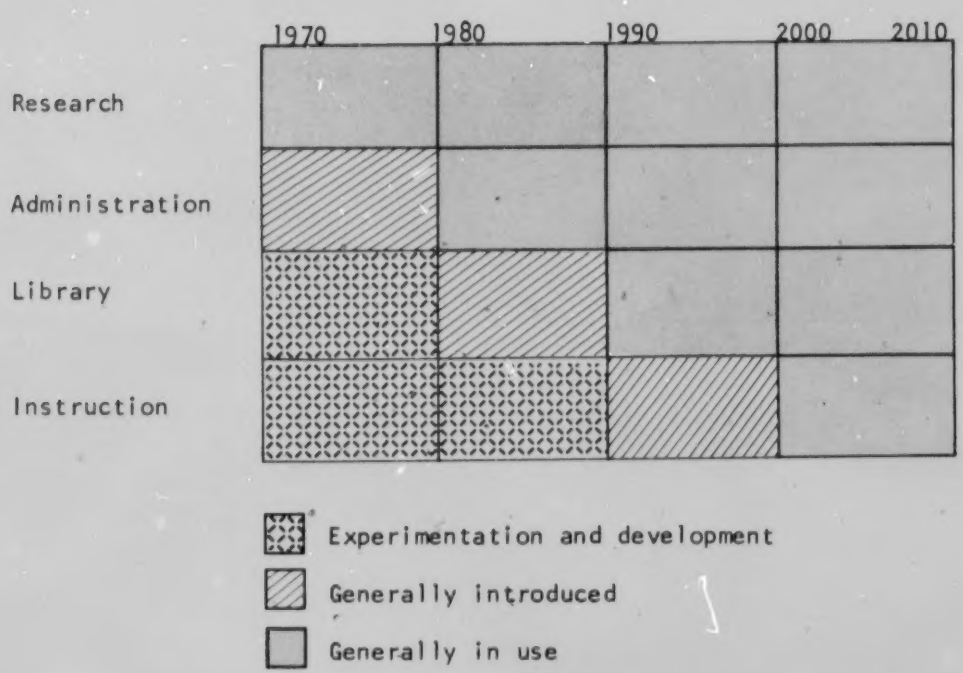
However, it is also clear that whether or not teleconferencing is perceived as a nonextravagant, appropriate technology will depend on more than the technology itself. It will depend on the ways teleconferencing technology is *used*. Teleconferencing can be viewed as a modest technology. However, it can also be extended in scale and complexity far beyond the usual definitions of intermediate technology.

Future uses of teleconferencing, then, will determine whether it will be viewed as an extravagant or a practical advancement in educational communications. In reporting their impressions of the development and acceptance of educational technology, the Carnegie Commission projected uses

of electronic technology in research, administration, library, and instruction to the year 2010 (see Figure 1). The Commission was assessing electronic technology in general, of course, and gave little direct consideration to teleconferencing technologies.[9] Their assessment of the overall patterns is interesting as background for examining uses of teleconferencing. They expected an overall growth in the use of electronic technology in higher education, beginning with research. Administration, libraries, and finally instruction would gradually be fully saturated by the use of these new media by the end of the century. As will become clear in Chapter Two, the uses projected by the Commission are quite different from those now emerging for teleconferencing. Our own assessment of likely developments will be presented in Chapter Four.

FIGURE 1

ESTIMATED USE OF ELECTRONIC TECHNOLOGY
(COMPUTERS, "CABLE" TELEVISION, VIDEOCASSETTES)
IN HIGHER EDUCATION



Source: Carnegie Commission on Higher Education, *The Fourth Revolution: Instructional Technology in Higher Education*, McGraw-Hill Book Company, Hightstown, New Jersey, 1972, p. 2.

NOTES

1. Bernard Z. Friedlander, "Instructional Television: An Agenda for Self-Analysis," in Douglass Cater and Michael J. Nyhan, eds., *The Future of Public Broadcasting*, New York: Praeger Publishers, 1976, pp. 100-1.

2. The purposes and priorities assigned to educational technologies are summarized in a 1973 Ford Foundation study. They emphasize that the purposes foreseen for educational technology were sometimes quite focused (e.g., make up for the teacher shortage) but often combined multiple concerns for quantity, quality, and the teaching-learning process itself. In fact, mixed--sometimes conflicting--purposes were often involved. There was also a strong focus on the *products* of education, but not much on the *process* of introducing and using the technologies. Small-group interaction such as that provided by teleconferencing was rarely part of the stated purposes for educational technology during this period. See James W. Armsey and Norman C. Dahl, *An Inquiry into the Uses of Instructional Technology*, New York: The Ford Foundation, 1973, especially pp. 7-17.

3. The societal forces affecting the evolution of teleconferencing will by explored in more detail in Chapter Four of this report.

4. E. F. Schumacher's most well-known book is a collection of essays published under the title *Small Is Beautiful: Economics as if People Mattered*, New York: Harper & Row, 1973. See also *A Guide for the Perplexed*, New York: Harper & Row, 1977.

5. Surprisingly, good quality audio sound is often quite difficult to achieve. Room acoustics are often problematic, as are microphone, transmission, and loudspeaker arrangements. Even in sophisticated video teleconferencing systems, it is often said that good audio quality is more difficult to develop than the video.

6. It is interesting to note that some forms of teleconferencing would have been technologically possible as early as the 1940s or 1950s. Although the technology used for teleconferencing has improved since then, it would have been *possible* to develop teleconferencing systems much earlier.

7. Published by University of Wisconsin-Extension, Radio Hall, Observatory Drive, Madison, WI 53706 (formerly *Telephone in Education Newsletter*).

8. Alvin Eurich, *Campus 1980*, New York: Delacorte Press, 1968, p. 246.

9. There has been a rather consistent trend in studies of educational technology to ignore small-group interactive media in favor of broadcast-oriented systems. This trend has continued; even the *International Yearbook of Educational and Instructional Technology, 1978/79* (Anne Howe and A. J. Romiszowski, eds., New York: Nichols Publishing, 1978) makes little mention of teleconferencing activities or potential. The 1977 book called *Distance Education: A Survey and Bibliography* (Börje Holmberg, Kogan Page: London and New York: Nichols Publishing Co.) ignores teleconferencing completely, though its purpose is to survey all forms of distance education.

Chapter Two
Who Is Doing What

Current applications of teleconferencing in postsecondary education vary with the needs and resources of users. Our study of existing systems spanned formal and informal settings, from universities to community volunteer organizations. The range of organizational types represented in this study is as follows:

- Professional association The system provides continuing education and updating for professionals, often in the allied health sciences.
- State university extension system Credit and noncredit courses are offered to students, who do not attend classes on a full-time basis. Continuing education may be general or specific, such as courses offered through an agricultural extension.
- Corporation A teleconferencing network facilitates communication among distantly located branches of the corporation and provides a means of relaying current product information and training staff.
- Government agency The network is used to train civil service employees and to coordinate projects, information, and decision making among regional offices.
- University medical school A teleconferencing network provides continuing education courses for allied health-care workers to meet certification requirements and promote occupational advancement.
- College/university system This kind of system provides an alternative means of delivering courses and student services, conducting job searches, and presenting guest lecturers.
- Community services group A community-based and operated teleconferencing system provides a link among specific populations of the community, for example, children and the elderly.

- Media service organization A private nonprofit agency provides program development, research, and media services to member subscribers, who do not have their own teleconferencing networks.

Teleconferencing, however, has had only a limited impact on postsecondary education to date. Fewer than 20 universities or university extensions in North America have active programs. Five medical schools, two dental schools, and two pharmacy schools are also actively involved. We identified only two government agencies that have instructional teleconferencing programs--one in the United States and one in Canada. Our survey also revealed only a handful of community organizational programs and one corporate teleconferencing system.

Figure 2 summarizes the number of teleconferencing systems operated by different types of organizations. It should be noted that this figure indicates only the *number* of separate organizations in each category. Thus, a very large program is counted equally with a very small one. As a general overview, however, the figure summarizes the organizational arenas that currently display the most activity.

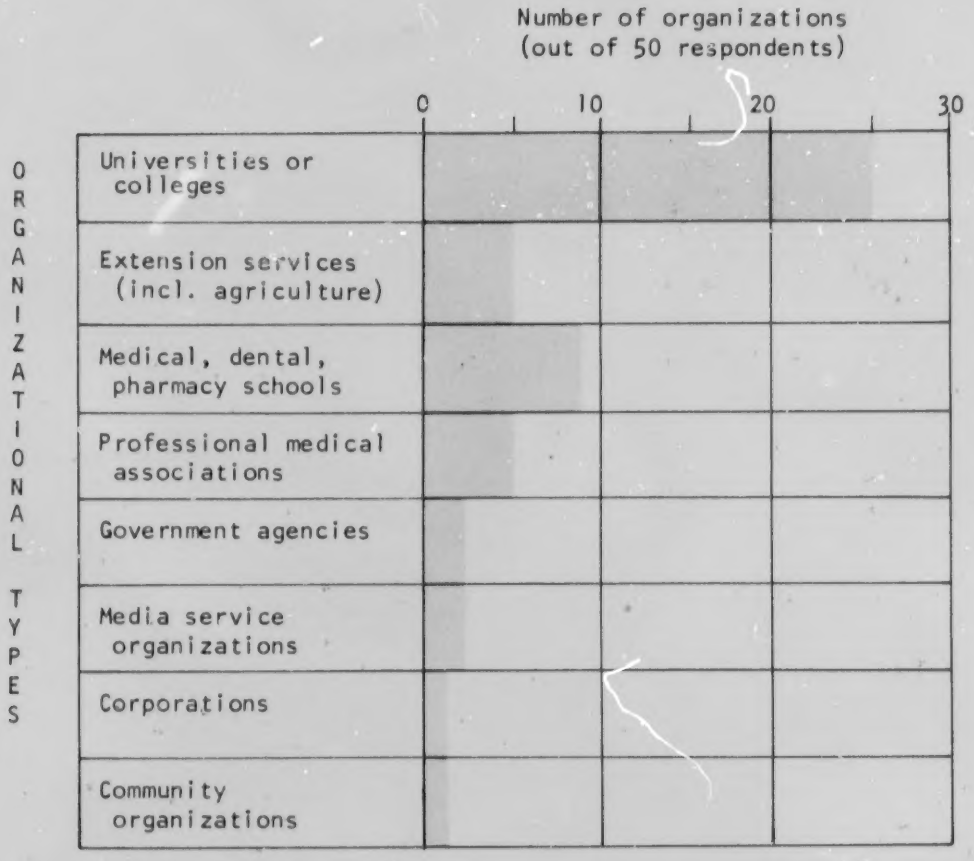
While most applications of teleconferencing have been instructional, there are also noninstructional uses in educational settings. The basic functions of teleconferencing that we have identified make up the structure of this chapter: (1) instruction, (2) administration, (3) student services, and (4) interorganizational communication. This chapter provides illustrative examples of current uses of teleconferencing; for more detailed information about specific systems, see the section "A Closer Look at Systems."

INSTRUCTION

Teleconferencing provides alternative means of delivering educational services. The goal may be to upgrade the quality of current educational

FIGURE 2

TYPES OF ORGANIZATIONS OPERATING
TELECONFERENCING SYSTEMS



to instructional resources. With varying degrees of success, teleconferencing has already extended the possibility of quality instruction to a wider range of students.

USER POPULATIONS VARY

Participants in instructional teleconferencing include both faculty and students; sometimes these roles are not formally defined, as the instructor may employ varied teaching methods to encourage interaction. Most instructors are on university and extension faculties, although some (such as medical doctors) are associated with professional groups.

Courses offered over teleconferencing appeal to students for a variety of reasons. These media allow individuals who live long distances from educational facilities, are homebound, or are very busy to take advantage of services that are not otherwise accessible to them.

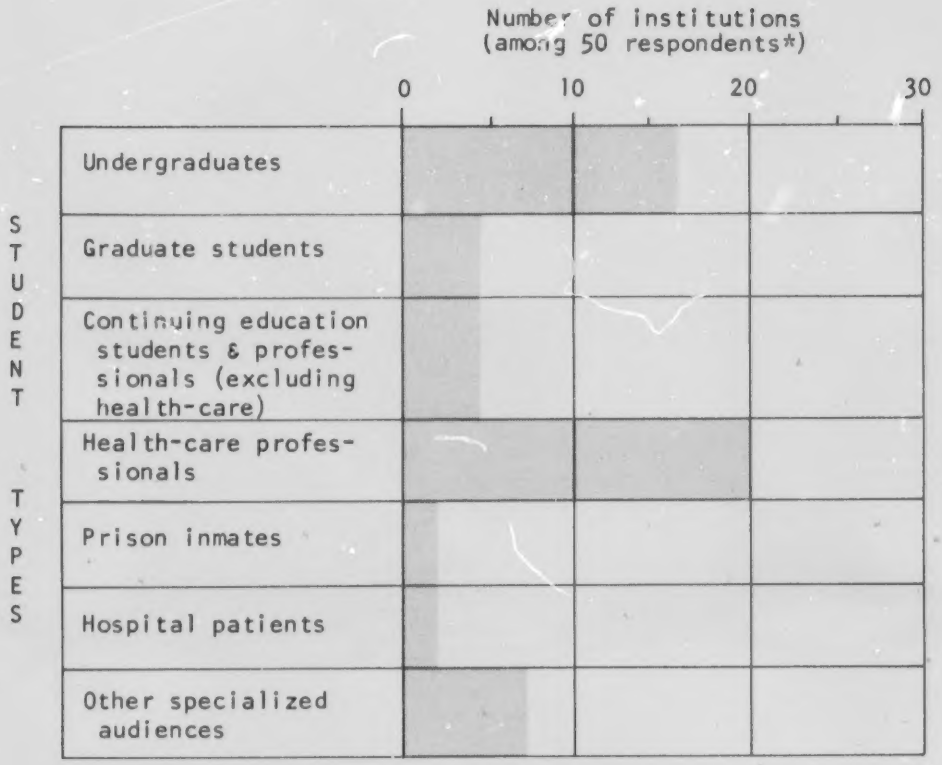
Figure 3 summarizes the number of institutions serving different types of students. It not only suggests the range of student groups involved, but also shows the relative predominance of both health-care professionals and continuing education students. Other student groups are only reached by a small number of systems.

In addition to personal motivation for professional growth, health-care professionals often have a need to comply with requirements for relicensure and recertification. Medical associations seek to aid member institutions in conforming to operational standards set up by such regulatory agencies as the Joint Commission on Accreditation of Hospitals (JCAH), Occupational Safety and Health Administration (OSHA), and other branches of the U.S. Department of Health, Education, and Welfare (HEW). Groups like the Texas Hospital Association, Oklahoma Hospital Shared Services, Inc., and the Center for Disease Control (CDC) are all making active use of teleconferencing for instructional purposes.

Professional medical associations may also provide programming for individual patient groups. Topics include specially tailored educational materials designed for the layman regarding health maintenance and precautions

FIGURE 3

NUMBER OF INSTITUTIONS SERVING
DIFFERENT TYPES OF STUDENTS



*Some systems serve a variety of clientele.

about specific illnesses. For example, courses may be designed to provide information on nutrition for diabetics or prenatal care for expectant mothers.

Athabasca University in Alberta, Canada, was designed in a fashion similar to the Open University in Great Britain. Having no centralized campuses, both institutions employ "open admission" policies that allow anyone to enroll at any time. Students who might be unwilling or unable to attend classes in a more traditional setting, due to time, geographic, health, cost, or other constraints, have ready access to educational opportunities. Open University provides course content via prepared course materials mailed to enrollees, augmented by teleconferencing among tutors and remote students. Open University also produces instructional television programs designed to supplement packaged course materials and provide an alternative to the teacher-lecture classroom activity. Pilot tests of Athabasca's audio teleconferencing capability are scheduled to begin in the fall of 1978.

WHAT IS TAUGHT VIA TELECONFERENCING?

There are few areas in which at least *some* courses have not been attempted via instructional teleconferencing. Certain subject areas are naturally more suitable for teleconferencing than others. For instance, audio teleconferencing alone would be inappropriate for subjects that involve complicated graphics presentations or other visual displays. But no clear-cut rules have emerged regarding areas that should or should *not* be taught via teleconferencing: most subject areas are compatible with teleconferencing media, if enough ingenuity is used in designing the course itself. By stressing development of group cohesiveness and encouraging interaction, less emphasis can be placed on the medium and more on specific course content. As in face-to-face teaching, much depends on the commitment and resourcefulness of the faculty and students.

In its 13-year history, the University of Wisconsin-Extension has developed the broadest array of course offerings provided by any educational teleconferencing system. More than 150 course series are currently offered over the network each year. Topics include business, engineering, health

and medicine, home economics, music, communications and journalism, library science, and continuing education for attorneys (to meet requirements set by the state).

While the range of course topics varies as much as user populations, the majority of existing courses focus on the allied health sciences, for example, dentistry, pharmacy, and nursing. The Center for Disease Control in Atlanta offers a broad range of instructional programs involving medical topics. CDC does not operate an independent teleconferencing network but provides program content to established teleconferencing networks, which primarily serve medical laboratory personnel in hospitals and private laboratories. The Center often prepares audio tapes or slides in advance and distributes them broadly to interested institutions. Teleconferences on specific topics are also held frequently.

Oklahoma Hospital Shared Services, Inc., offers accredited courses for relicensure and recertification of health-care professionals--particularly those who practice in rural areas and need convenient access to educational resources. They also provide information on advances in medical science and on procedures for compliance with health-care legislation.

Another field in which teleconferencing is proving its utility is agricultural extension service delivery. The Minnesota Agricultural Extension Service operates teleconferencing facilities in about 40 counties throughout the state. Students enrolled in telelecture can also attend local courses and small group meetings. Telelecture topics have included: landscaping, water supply and sewage, vegetable and fruit culture, crop and livestock management, and farm estate planning.

A number of innovative educational programs have been designed for specific groups. The New York University-Reading Consortium has developed an interactive video teleconferencing system in response to the needs of senior citizens in the Reading area. Programs focus on nutrition and general health maintenance information. Through this system, older persons can "attend" meetings with public officials and seminars on social security laws and other topics covering a wide range of social services available to local elderly residents. The system is also used to put elementary and secondary school students in contact with senior citizen groups for discussions of social

studies topics. (For instance, as part of their course in American history, Reading elementary school students interviewed senior citizen groups about their city during the Depression.) The Reading system exemplifies the innovative use of teleconferencing by a community-based organization: targeting a specific audience, incorporating their unique needs in development of program content, and facilitating their involvement in community activities.

ADMINISTRATION

At present, the use of teleconferencing in postsecondary education for administrative functions is far less common than instructional uses. By administrative purposes, we mean the use of teleconferencing in the operational aspects of postsecondary education programs: staff meetings, budget reviews, and other meetings typically held in administering educational programs. Such meetings focus primarily on decision making and information exchange.

An analysis of administrative meetings held via teleconferencing at the University of Quebec reveals four distinct types, listed in decreasing order of frequency:

- The urgent meeting: arranged quickly, when the need is so pressing that travel would not have been possible
- The routine meeting: direct substitution for a meeting that could typically take place face-to-face, such as a monthly committee or coordination meeting
- The meeting concerning a face-to-face meeting: preplanning or follow-up to face-to-face meetings
- The additional consultation meeting: getting an additional opinion in a situation that would have necessitated an independent decision if teleconferencing had not been available[1]

The University of Quebec is one of the heaviest users of teleconferencing for administrative meetings. An audio teleconferencing system connects the major centers of the university: Quebec City, Trois Rivières, Montréal, Chicoutimi, Rimouski, Hull, Rouyn, and various centers of the Institut national de la recherche scientifique. Since the teleconference facilities are conveniently located for users, the system has become a major medium for coordination and administration of the activities at the widely separated regional campuses. It is used for groups such as: the executive committee of the University, the libraries committee, the computer center, the committee of deans, the personnel divisions, and the finance committee.

Another illustration of successful administrative uses of teleconferencing in a university extension environment is the Cooperative Extension Service at the University of Illinois. Its audio network serves 10 regions of the state, covering 102 counties. Teleconferencing is used for communication among directors and field staff in each of the regional and county offices. Much unscheduled, informal communication is conducted over the system, primarily concerning the day-to-day operations of the extension service and exchange of information among staff.

The University of Michigan uses one of the more unconventional approaches to administrative teleconference meetings. In an experimental computer-based teleconferencing program working primarily with faculty committees, they are exploring varied approaches to group decision making. For instance, instead of simple majority rule, weighted voting procedures are sometimes used to allow for differentiation as to how strongly each voter feels on a given issue. Computer-based programs are used in conjunction with audio teleconferences to facilitate tallying procedures. This program is being tested and has received only limited application, but it does suggest at least one alternative approach to administrative meeting formats using teleconferencing media.

Although few medical schools and professional associations use teleconferencing for administrative purposes, the University of North Dakota's Biomedical Communications System (operating within the School of Medicine) utilizes an audio teleconferencing network that covers the entire state. Programs are sent from Bismarck, Fargo, Grand Forks, and Minot to 28 receiver

locations in 13 communities. Although the teleconferencing system was originally established in 1977 for instructional purposes, its users quickly realized its potential for convenience and economy in conducting administrative and faculty meetings. The network was used extensively for this purpose during the last program year, when heavy blizzards prevented face-to-face conferences.

The Staff Development Branch of the Public Service Commission, which is the Canadian counterpart to the U.S. Civil Service Commission, provides linguistic and managerial training to over 20,000 civil servants per year. Audio teleconferencing facilities are located in 12 cities across Canada. Administrative applications of teleconferencing include coordination of information, updates on projects, budgets, and other decision making. The decentralized nature of this agency frequently necessitates immediate access to information and resources.[2]

The National Aeronautics and Space Administration's (NASA) audio teleconferencing network, while not in a postsecondary educational environment, does illustrate some varied administrative uses. They have found audio teleconferencing to be an effective medium for coordinating highly task-oriented activities, such as the current Space Shuttle Program. Holding regular day-long coordination meetings via teleconference allows participants to come and go as the subject matter requires their presence. NASA officials often need to give group presentations requiring a number of people from a specific location. Rather than send the whole group, one individual may attend in person, and the rest can be available by teleconference. Thus, the single representative can be present for informal gatherings over coffee or after the meeting, while the entire group is involved with the substance of the meeting.

Roche Laboratories, a large pharmaceutical firm that has customers throughout the country, is also making use of teleconferencing for administrative purposes. Roche's large field sales staff must coordinate individual efforts in order to be well informed about new products and health-care methods and to provide rapid feedback of marketing data to the home office.

These examples of administrative uses of teleconferencing suggest that postsecondary education is only beginning to learn about this area of application.[3] The best examples come from institutions that are decentralized by their very nature, such as university extension services and multicampus systems.

STUDENT SERVICES

A wide range of services such as counseling, recruitment of new students, course advising, career placement, financial aid, registration and records, or housing information, is generally provided to students. Many of these services, of course, will always be best provided in person, as no electronic medium can replace human contact. But there are a number of areas where teleconferencing seems well matched to student needs.

The Open University in Great Britain has made some use of "telephone tutors," who are available to facilitate teleconferences among student groups and to respond to individual student needs. These discussion sessions are conducted with *groups* of students enrolled in the same course. Although the tutors' role is primarily instructional, it has considerable student service potential. The relationship with the tutor is not limited to telephone contact. A study of one tutor group reported:

> Some students had met their tutors before the conference call and felt this made a difference. . . . For those who had never met their tutors, there was usually some personal contact made by telephone between conference call sessions. Students were encouraged to telephone their tutors and counselors if they had any difficulties with the course, although they were often reluctant to do so.[4]

Thus, merely providing access to telephone counseling does not guarantee that it will be used. Periodic face-to-face meetings and developing skills in telephone counseling/advising are very important.

The strengths of teleconferencing as a student services medium are similar to its advantages for instruction. Perhaps the most important is

accessibility. Teleconferencing, combined with an existing telephone network, can provide broad access to services for students who may be homebound, handicapped, or living in rural areas. Tape recorded messages could, for instance, answer frequently asked questions, with a staff person available as needed. (A number of dial-access message systems like this are now available, but they are rarely combined with a teleconferencing capability that would allow group interaction.)

Group counseling sessions could be scheduled at convenient times to answer questions concerning admissions requirements, provision of credits, financial aid, and student housing information. Representatives from several academic departments could meet along with student service personnel and prospective enrollees via teleconference and alleviate the need for interested applicants to wait for written responses to standard queries or for face-to-face meetings to clarify enrollment procedures. Computer conferencing could allow direct questions to resource people or counselors without the need for all to be present simultaneously. Students and counselors who are widely separated geographically could still communicate effectively.

The use of teleconferencing in student services could provide users with an initial orientation to the system itself, prior to the use of teleconferencing in the "classroom" activity of a course delivered over a teleconferencing system. Orientation in advance of actual participation in a telelecture would give students a chance to see if they like using the medium before they enroll in a course.

INTERORGANIZATIONAL COMMUNICATION

Cooperative teleconferencing efforts that allow exchanges among postsecondary educational organizations offer benefits to everyone involved. Possibilities include: development of common course offerings or joint

projects, periodic exchanges of information, and sharing of computer or library resources. However, few such interorganizational exchanges have been actively pursued, and they have often been difficult to initiate, orchestrate, and maintain. The instructional "basics" are usually given first priority. Yet exchanges among organizations can avoid duplication of efforts and increase available resources.

The University of Wisconsin-Extension has been involved in a number of interorganizational exchanges that have utilized audio teleconferencing. One effort, called "Clergy Partyline," was undertaken in cooperation with Kansas State University. The audio teleconferencing networks in Wisconsin and Kansas provided a two-state linkage, including resource people from other locations. The first meeting, held in December 1977, involved clergy from Kansas and Wisconsin, as well as a resource person in Kentucky.[5]

Another type of organization involved with interorganizational uses of teleconferencing is a media service group called Communications in Learning, Inc. of Buffalo, New York. This nonprofit, regional, educational organization provides teleconferencing services for universities, hospitals, and corporations who would like to use teleconferencing but do not have the resources or administrative support to set up their own private system. Communications in Learning supplies the technology, course materials in a number of fields, and even instructors if they are needed. Such service organizations might become more common in the future, since they provide access to teleconferencing without the commitment and possible difficulties of operating a network.

Although their system now operates on a limited basis only, Stephens College in Columbia, Missouri, had one of the pioneer efforts in the interorganizational use of teleconferencing. In 1958 Stephens instituted a program that linked several small colleges by conference phone in a system designed to share educational resources and to present guest lecturers in various fields. The program was targeted specifically toward liberal arts colleges in the South and provided students at these institutions with a unique opportunity to exchange ideas and information with prominent literary and political figures.

Some of the most interesting efforts in interorganizational uses of teleconferencing have involved computer-based networks. In 1976, for instance, a 20-day computer conference linked 14 professors from small colleges to develop a model for use in psychology classes. The professors had an initial face-to-face meeting but did most of the actual work over the teleconferencing network. A follow-up face-to-face meeting was also held. In this case, teachers from small colleges in remote areas were linked with other colleagues in a collaborative effort. Teleconferencing provided a format for these efforts by connecting faculty members who are often cut off from their counterparts at other institutions. However, this example was supported by a foundation grant; there are few known examples of the institutions themselves supporting such an activity.[6]

The University of Michigan has done some exploration of the use of computer conferencing to support professional communication, and some of this support has come directly from the university. National committees, regional planning groups, on-campus working groups, and consulting groups have all used their system. One international congress also used computer conferencing as a parallel medium for increasing the number of participants in the sessions.[7] Most of these applications are to some extent interorganizational communication.

EDUCOM (Interuniversity Communication Council), another media service group, was developed to allow a network of universities to share computer resources and is also making some use of computer mail, which provides person-to-person communication, rather than group communication. Geographically separated working groups and committees use these media to coordinate their activities.

Communication satellites have the potential to greatly expand the utility of teleconferencing, especially for interorganizational communication. Organizations that are widely separated geographically could have inexpensive communication links via satellite. For instance, the Public Service Satellite Consortium is an organization of about 90 institutions exploring the utility of satellites for public-sector applications, including postsecondary education. Demonstrations have already been held using the

U.S./Canadian Communications Technology Satellite. The American Hospital Association, the University of Alabama, Stanford University, and Carleton University have also held experimental teleconferences by satellite.

Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT) initiated a project in 1971 that linked two campuses of the University of Hawaii by ATS-1 satellite, provided by NASA. The video network began expanding in 1972 and currently serves 16 terminal locations. The Center for South Pacific Studies at the University of California (Santa Cruz) and several foreign universities are presently included in the system. The network provides instructional communication among widely dispersed countries of the Pacific and supplies communications researchers with an operating satellite communication network for technical experimentation and exchange of information with other researchers in their field. In addition, the network is used for community development services, conferences, and professional medical consultation for health-care personnel in remote locales.

All of the preceding examples are limited illustrations of what might be possible using various teleconferencing media to promote interorganizational communication. The problems of implementing such arrangements are not primarily technical, but motivational and organizational.

CONCLUSION

The general message from our survey of current levels of teleconferencing activity in postsecondary education is this: by far the most frequent teleconferencing applications have been instructional, though even here the range of efforts has been limited. Some groups have attempted administrative applications, but the potential for delivering student services and establishing interorganizational communication links is largely unexplored. Thus, while a number of teleconferencing efforts within postsecondary education have been identified in this survey, the actual variation in applications is quite narrow.

Current experience with teleconferencing media provides only limited guidance concerning future applications. Typically, educational institutions have attempted to match the unique capabilities of teleconferencing media with educational needs. Yet an in-depth exploration of the educational utility of teleconferencing should expand the range of future applications. The limitations of future uses will be determined as much by the perspectives and vision of their users as by restrictions imposed by the media themselves. Certainly one of the major restrictions of concern to educators is the issue of cost, the topic of the next chapter.

NOTES

1. John Short, *A Report on the Use of the Audio Conferencing Facility in the University of Quebec*, Communications Studies Group, Research Report P/73161/SH, London, 1975.

2. Nicole Mendenhall and Michael Ryan, "A Survey of Teleconferencing Studies in the Public Service Commission," in Lorne A. Parker and Betsy Riccomini, eds., *The Status of the Telephone in Education, Volume 2*, 1976, pp. 104-5.

3. For a description of noneducational uses and potentials of teleconferencing, see Robert Johansen, Jacques Vallee, and Kathleen Spangler, *Electronic Meetings: Technical Alternatives and Social Choices*, Reading, MA: Addison-Wesley, 1978.

4. Susan Holloway and Sandy Hammond, "A Study of Users' Reactions to Two Telephone Trading Systems at the Open University," in Parker and Riccomini, op. cit., p. 117.

5. "Two Networks Join Forces," in *Telecoms: Teaching and Training Newsletter*, vol. 2, no. 2, Winter 1978, p. 4.

6. Philip F. Spelt, "Evaluation of a Continuing Computer Conference on Simulation," *Behavioral Research Methods and Instrumentation*, vol. 9, no. 2, pp. 87-91.

7. These applications are summarized in Karl L. Zinn, "Computer Facilitation of Communication within Professional Communities," *Behavioral Research Methods and Instrumentation*, reprint, April 1977.

Chapter Three
What Price Teleconferencing?

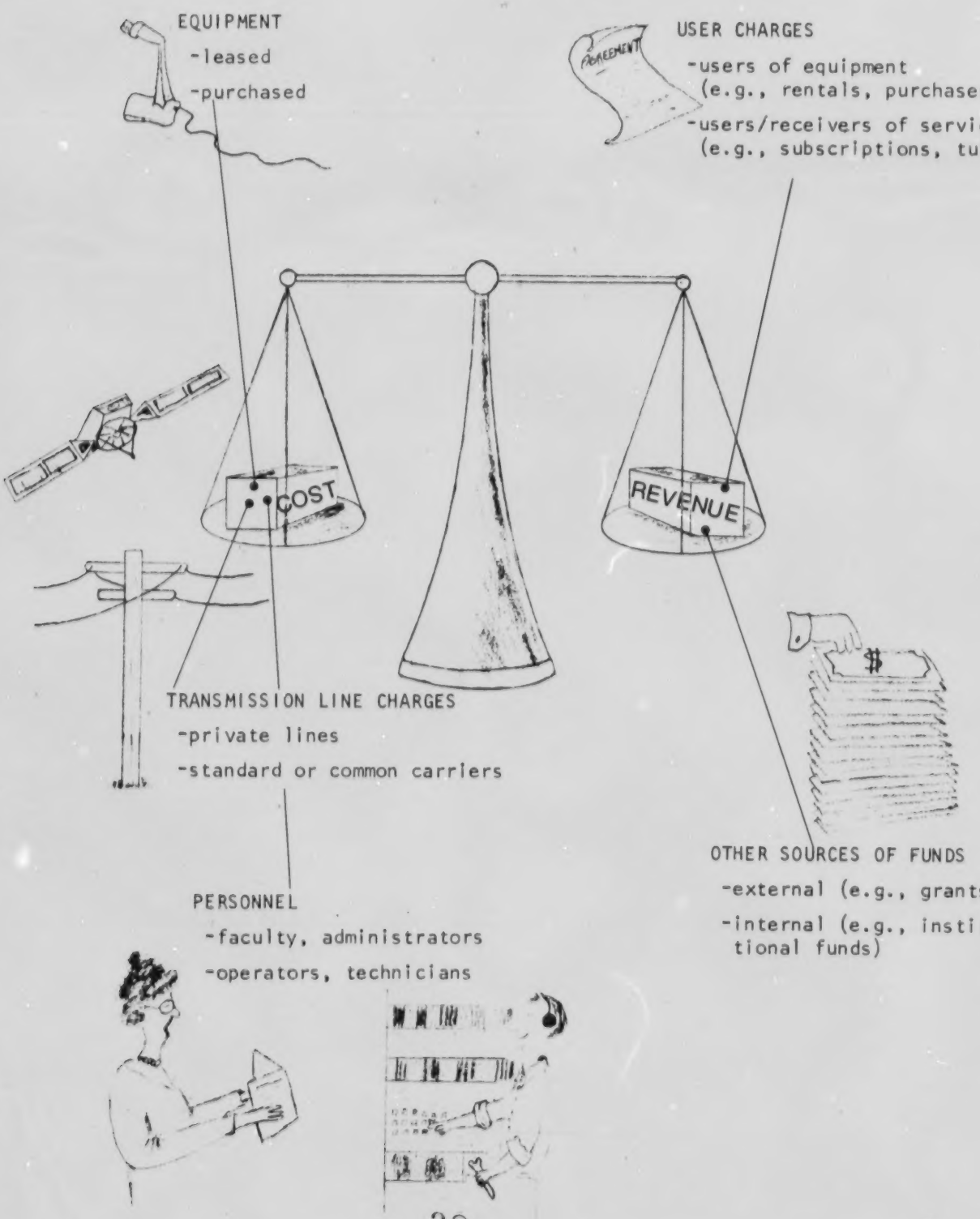
While there is little doubt that teleconferencing offers intriguing educational potentials, the first and often the last question that arises is: How much does it cost? Although a full cost/benefit analysis of teleconferencing in education is beyond the scope of this project, we have examined and compared various cost components of current systems. We have been able to make some determinations of what audio teleconferencing systems might cost those who wish to implement them and to present useful economic information in a number of categories. Neither video nor computer conferencing, however, has been used enough in postsecondary education to justify even this initial cost analysis. Thus, the focus of this chapter is almost exclusively on audio teleconferencing.

The basic cost and revenue components of teleconferencing are summarized in Figure 4. Expenditures for personnel, equipment, and transmission line charges are offset by user charges and other sources of funds. Although general cost information was requested from all 51 organizations covered by the survey, fewer than half provided detailed accounts. Specific questions about each cost and revenue category often yielded qualitative rather than quantitative responses (e.g., "much of our money is spent on . . . ." rather than a dollar amount).

Part of the difficulty in obtaining cost information on teleconferencing stems from the separation of personnel functions in educational organizations. Frequently, the operator of a system supervises the day-to-day teleconferencing activities, but is not highly involved in initial investment decisions and final preparation of annual operating budgets. Budget officers, who are more closely involved with cost issues of teleconferencing, are often several steps removed from survey respondents. Overall, economic information on teleconferencing is scarce and the quality variable.

FIGURE 4

REVENUE & COST
COMPONENTS OF TELECONFERENCING



ELEMENTS OF COST

We have grouped audio teleconferencing cost components into two broad categories: initial investment and operating expenses.

INITIAL INVESTMENT

The category "initial investment" includes cost items incurred in the implementation of a teleconferencing system. Initial investment is comprised of equipment costs (not including upgradings and inherited resources), personnel time spent in development of the system, program materials, and charges for equipment installation.

A principal data aggregation problem concerning the costs of teleconferencing is the great variation in ways of determining equipment investment. When queried about equipment costs, most organizations could provide very little detail. One reason for this information gap may be that the cost of items already owned by the organization was not considered--even though they actually have value in the marketplace--because the teleconferencing program did not bear the expense directly. It was, therefore, listed as "zero investment" or aggregated in the institution's total communications equipment expenditures. Although not usually itemized by systems in their budget calculations, inherited resources (for example, equipment, course materials, or personnel already present in the organization) are a great boon to organizations that integrate them into their teleconferencing systems.

Initial investments in teleconferencing vary tremendously among systems. While most organizations begin with a nominal investment (by renting equipment and not involving program development costs), some invest several thousand dollars at the outset. Many organizations that make large initial investments have received substantial government or foundation support. For example, West Virginia University developed their teleconferencing network under a U.S. Department of Health, Education, and Welfare grant; the Reading, Pennsylvania interactive cable system was begun by the Alternate Media Center under a National Science Foundation grant. State government funding

provided the impetus for several systems that are now largely self-supporting, through subscription or tuition revenues. These systems include the Pennsylvania State University's program, the Utah State system, and the Oklahoma State Regents Network.

The climate of the early 1960s was quite favorable to innovation and experimentation in postsecondary education, at least in comparison to the present situation. An increase in college enrollments and resulting teacher shortages encouraged educators to seek ways to expand delivery of educational services. Since this was generally a period of liberal spending policies, funding for experimental programs was readily available. It was in such a climate that the University of Wisconsin-Extension, for example, implemented their impressive teleconferencing system without many of the financial constraints institutions must cope with today. Systems starting up in the 1970s have been generally smaller, less expensive, and more cautious in their investments.

OPERATING COSTS

Like initial investments, operating costs vary a great deal. Many systems are able to keep costs low by using available resources, such as telephone networks already in place and existing conference rooms suitable for teleconferencing. California State Universities at Sacramento, Sonoma, and Dominguez Hills use the California State University telephone network for much of their teleconferencing. Other institutions may arrange for their courses to be offered during "off hours"--in the evening or on weekends when transmission rates are generally lower. Besides lowering operating costs, off-hours programs are more convenient for persons who work.

In "A Cost Categorization Format," Philip Doughty outlines possible expenditures for research and development, replacement and updating, as well as for operation.[1] He also divides costs into those that are recurring/nonrecurring and fixed/variable. Subcategories of the format include: personnel, hardware, software, facilities, and institutional overhead. This model of costing might be particularly useful to those interested or currently involved in teleconferencing because it not only describes and

assesses costs and effectiveness based on existing data, but it may be used to generate alternatives and suggest associated costs that haven't yet been included in operating budgets.

Equipment

Reliable sources of information about equipment rental and purchase costs may be difficult to locate. As mentioned earlier, representatives of functioning teleconferencing systems are often marginally informed about these costs. Common carriers such as local telephone companies can provide fairly detailed descriptions of equipment, their costs, and estimates for costs of various combinations. However, these estimates may vary considerably, depending upon the specific characteristics of the system.

Most of the systems we surveyed were audio only, and their equipment rental costs rarely exceed $5,000 per year. The notable exceptions are systems that include many stations or branches, such as the University of Illinois and the University of Wisconsin-Extension. The average monthly cost for a portable conference phone such as the Western Electric 50-A is $20 to $25 per node or site. The Darome Convener, one of the more common pieces of equipment among those we queried, is available for lease or purchase. The current lease price for this unit is similar to that for lease of telephone company equipment, and Darome equipment is in fact being considered for tariffing by AT&T. More sophisticated bridges or "telepatchers" (which can connect large numbers of locations simultaneously without transmission quality reduction) can be leased for approximately $7 to $25 per month, depending upon the number of locations added.

Addition of graphics capabilities can considerably increase the price of a teleconferencing system. The Teleprinter, which can be used to transmit written lecture material to an outlying location over regular telephone lines, can be leased for approximately $90 per month. Although the electronic blackboard is not available in all regions, a number of systems have expressed interest in or experimented with it or similar equipment. Telephone company representatives have estimated that the electronic blackboard (with memory and demodulator receiver) may be available for lease at $500 to $600 per month.

Systems that purchase equipment have sometimes managed to save money by buying several units at one time. The Ohio State network, OMEN, buys amplifiers and loudspeakers "in bulk" and are therefore able to sell them to members at a much lower price. One of the advantages that OMEN members have found to owning equipment is that they are able to use their equipment for a variety of other functions (for example, they can purchase equipment compatible with other audiovisual aids they already own).

Transmission line charges

Actual teleconference transmission charges are the most difficult to identify of the cost categories we have outlined. One problem involved with determining transmission cost arises from the frequency variations of the circuits involved. For regular telephone lines, costs will also vary by time of day and day of week. Some organizations use only private lines that are "dedicated" for the purpose of teleconferencing, while others use standard telephone lines. Several of the systems located on campuses depend upon established campus networks and incur extra charges only when calls are placed off their network. Distance between sites is also important in determining costs of transmission, both for initial investment in dedicated lines and for billing calls over conventional lines.

The level of system usage is an important variable in determining what type of transmission system will be least expensive. For organizations with low to moderate usage, an existing campus network is often most efficient and inexpensive. However, representatives from the campuses and the telephone company have agreed that should teleconferencing usage increase to the point that the system is overloaded, the quality of delivery will decrease. Generally, for organizations with high usage, dedicated lines are more cost-efficient.

The University of Wisconsin-Extension System and the Indiana Higher Education Teleconferencing System (IHETS) are two examples of organizations that have established significant economies of scale. Both organizations include such a large number of locations and users that costs per unit (both locations and participants) are lowered. Although the Wisconsin ETN and IHETS investments are high, the systems have reached and exceeded the "break even" point.

The Educational Telephone Network in Wisconsin is a very large Telpak arrangement that costs approximately $8,000 annually (derived from the Telpak mileage formula); the fee for similar regular telephone service throughout the state would be about $45,000 under standard billing procedures.[2] The cost of the Telpak is the same regardless of how often the lines are used, an aspect that is important to heavily used systems such as Wisconsin's. Systems not using "bulk rate" transmission have significantly higher average costs per minute.

Personnel costs

Few organizations have attempted to itemize personnel costs involved with teleconferencing applications. Many systems rely upon faculty or staff members who are included in budgets of academic departments or organizational projects and who are, therefore, considered to be available at "no cost." No organization in our survey dealt with costs that might be incurred in training people to operate the system. Further, few respondents mentioned preparation for classes or meetings and the possibility that the preparation of course outlines and supporting materials to be delivered over teleconferencing might take more, or less time--and therefore money--than would face-to-face meetings.

Based on the experience of the University of Wisconsin-Extension program and on hypothetical situations, a telephone company employee, Ted Augustine, has devised a formula for costs per student contact hours comparing teleconferencing and face-to-face instruction methods.[3] While Augustine's formula omits some very costly items, it does take into account both personnel costs and some equipment prices. His formula is:

$$\left.\begin{array}{l}\text{Instructor's salary} \\ \div \\ \text{Number of courses taught}\end{array}\right\} = \text{faculty salary for one course (FS)}$$

$$\left.\begin{array}{l}\text{Total course hours} \\ \times \\ \text{Number of students}\end{array}\right\} = \text{student contact hours (SCH)}$$

$$\frac{\text{SCH}}{\text{FS}} = \text{cost per SCH}$$

Using Augustine's own estimates of scale of operation, the charges he derives for the various media are:

Face-to-face:	$3.46 per SCH
Audio:	$2.16 per SCH
Audio with graphics:	$4.20 per SCH
Video:	$25.86 per SCH

Although his costs are not contingent upon a minimum number of students participating (as some formulas are), Augustine points out that estimates could change significantly with increases or decreases in enrollment.

Another personnel-related cost consideration is the potential of teleconferencing to facilitate meetings to the extent that more sessions are held than might be otherwise. The decision to have a class or to hold a conference may rest more on the availability of equipment and lines than on the time investment of participants.

Lack of interest and data about personnel costs in teleconferencing systems lends some support to the misconception that "person hours" are not important to the cost calculations in educational teleconferencing. Personnel time is a substantial component of the overall cost of a teleconferencing course--just as it is in face-to-face courses. However, appropriate use of electronic media may, in the long run, reduce rather than increase this cost component.

REVENUE SOURCES

Whether the cost of using teleconferencing in education seems high relative to traditional educational methods will depend largely upon the revenues a system is able to generate. While educational groups are usually not explicitly profit-oriented, they do strive to break even. Financial viability is definitely one component of success. Although systems may

reasonably look to outside sources such as grants for start-up funds, they must ultimately expect to significantly contribute to their own support. The major sources of revenue for audio teleconferencing systems to date have been as follows:

USER CHARGES

Respondents in our survey were better informed about user charges than any other cost or revenue category. Because many of the systems depend entirely on user charges for their revenues, it is critical that the fees be current and accurately reflect the organization's investment in teleconferencing.

This category may actually be divided into two sections: *individual users* and *organizational users*. The costs for the two groups are determined in different ways, with the individual user sometimes receiving a "subsidized" rate.[4] A user charge is usually levied for instruction over teleconferencing; however, teleconferencing delivery of administrative, student services, and inter- or intraorganizational communications is generally not charged to users.

Charges paid by individuals are for instruction. For instance, California State University campuses, Kirkwood Community College, and Illinois State University require students to pay regular tuition charges for credit courses offered through teleconferencing, just as they would for face-to-face instruction. In the case of Illinois State, the cost is approximately $21 per semester unit. For continuing education courses charged to individual students, the costs are fairly low. Courses offered through the University of Illinois Extension can be free, $1, or $5 (based on local county decisions). The University of Delaware charges $57.50 for a 10-lecture series. West Virginia University has a registration fee of $5 and a course fee of $10, which is shared by the enrollee, the sponsoring agency, and the university. None of the institutions we surveyed charged individual students more for courses offered via teleconferencing than they would for conventional offerings.

Organizational users generally pay subscriptions for teleconferencing services. The cost formula is based on the number of participants per site, number of sessions given per year, and sometimes line or transmission charges. An average charge to subscribers is difficult to ascertain: many of our respondents supplied costs per program or session, while others provided us with costs per season or year. Some medical programs were fairly expensive: subscriptions were $5,000 to $10,000 per year. Subscriptions for two agencies on the low end of our range were $55 and $196 annually. Most individual programs offered by professional medical associations were $20 to $30 each, depending upon the number of professionals employed by the organization (or in the case of hospitals, the number of beds was often used in setting subscription rates).

Although a handful of organizations were able to give some notion of how much of their operational expenses user charges were able to cover, most respondents did not attempt to draw a link between revenues and expenditures.[5] However, we did identify several systems operated by professional associations that are currently receiving their total revenues from subscriptions or user fees. For example, the Texas Hospital Association charges member hospitals $55 per program, which has been sufficient to cover their annual operating expenses of $40-50,000.

INSTITUTIONAL FUNDS

In a number of noninstructional applications of teleconferencing, no charges are required of users. Two applications that fit loosely under user services are the Reading, Pennsylvania interactive cable system (Berks County Television) and Syracuse University's Project Advance. In both situations, funding for the projects comes from organizational sources: from the state Neighborhood Assistance Act and voluntary community contributions and from the university respectively. Utah State University and Roche Laboratories, which use their systems for administrative (and updating) purposes, charge no user fees. The communication is charged to the organizations as part of the necessary costs of operation.

While "cost avoidance" was not emphasized by our respondents, teleconferencing has the potential to save time and travel costs. A representative of California State University, Sacramento mentioned two ways in which costs saved through teleconferencing help them balance expenditures and revenues. (1) Much of the costly process of interviewing prospective faculty and administrators is reduced by initially screening applicants via teleconference. (2) Teleconferencing courses have drawn large numbers of students, which in turn means more FTEs (full-time equivalents), and consequently additional government support based on increased enrollments.

EXTERNAL FUNDS

Many teleconferencing systems have relied heavily on foundation or government support for start-up funds. In some cases, programs were intended to be experimental and were discontinued when grant money ran out. Contrary to expectations, organizations that initially received funding from outside sources were often able to find other means of support.

ESTIMATED COSTS: TWO HYPOTHETICAL SYSTEMS

Although none of the organizations we surveyed provided complete budget information, with the help of some representatives of teleconferencing systems and a staff member of a telephone operating company, we were able to arrive at figures for implementation and operation of two fairly typical, small-scale audio teleconferencing systems. We have concentrated on audio delivery systems because they have been the most prevalent system type in use to date. Estimates are based on line and equipment charges for the state of California and may vary to some degree for other locales. Personnel costs are not included in these estimates, as the variations in this category among different organizational types is considerable.

EXAMPLE A

The estimated costs of Example A show the minimum investment needed for implementation and first year's operation of a simple audio teleconferencing system. Transmission is via regular telephone lines, linking two sites that are 400 miles apart. Typical usage of this network involves instructional sessions and agency updates between these two sites. Sessions (of 45-minute duration) are scheduled six times daily (three day/three evening), three days per week. The duration of one program year is 40 weeks.

Equipment costs:

Equipment	Installation Fee	Monthly Rental
Portable conference telephone	$55.00	$14.75
Modular connecting block	20.00	-0-
Business line	45.00	7.50

Transmission rates:

Day		Evening	
First minute:	$.59	First minute:	$.35
Additional minutes:	.39	Additional minutes:	.24

Equipment (installation and rental):	$ 387.00
Transmission:	3,439.20
TOTAL FIRST-YEAR INVESTMENT:	$3,826.20

EXAMPLE B

This network might be used by a professional association, an extension service, or a university with several satellite campuses. Example B includes

a central facility with five sites about 400 miles apart. Programming is presented five times per week for one hour, including four evening and one daytime session for 40 weeks (transmission rates remain as for Example A).

Equipment	Installation Fee	Monthly Rental
Portable conference telephone	$55.00	$14.75
Telepatcher KTS/500	70.00	20.50
Six-button key telephone	21.00	2.20
Business lines	45.00	7.50
Telephone	27.00	3.00
Line illumination	13.00	3.00

Equipment (installation and rental):	$ 2,362.40
Transmission:	16,328.00
TOTAL FIRST-YEAR INVESTMENT:	$18,690.40

These two hypothetical systems provide basic support for the conclusion that audio systems can be implemented and operated at fairly moderate rates. Even the expense incurred in adding personnel costs and additional equipment (e.g., graphics capabilities) could often be balanced by revenue from user charges, grants, or interagency funding. In comparing actual figures from systems with comparable equipment and transmission networks, we found their operating expenses to be compatible with our estimates for Examples A and B.

CONCLUSION

Although our study does not contain enough information to estimate cost efficiency of teleconferencing, respondents did report a number of ways in which teleconferencing at least contributes to its own support. And there are undoubtedly many other ways, such as interorganizational resource sharing, in which the economic attractiveness of these media will increase. The cost of a large-scale system is undeniably substantial. Yet a modest system can be implemented on an intermediate scale at relatively low cost. Clearly, more detailed information on specific elements of cost is needed. We suggest that a full-scale exploration of this area would greatly benefit groups who want a detailed answer to this chapter's initial question: What price teleconferencing? This current study has provided only partial answers.

NOTES

1. Philip Doughty, *Guidelines for Cost-Effectiveness Analysis for Navy Training and Education*, special report from the Navy Personnel Research and Development Center, San Diego, California, July 1976.

2. Telpak is an arrangement through which a customer can order a group of intercity circuits between specific points and pay a flat or "bulk" rate per airline mile. Telpaks may be purchased in various size increments.

3. Lorne Parker, Marcia Baird, and Dennis Gilbertson, "Introduction to Teleconferencing," *The Telephone in Education*, University of Wisconsin, Madison, 1977, p. 36.

4. By "subsidized" charge, we refer to the fact that organizational users' fees generally include portions of the overhead costs of a system, while individual user charges represent closely what organizations anticipate individuals would be willing to pay for some service.

5. West Virginia University and Kirkwood Community College were two of the exceptions. West Virginia University has determined its individual tuition rates and subscription levels to cover almost all of its expenditures. Kirkwood Community College plans to receive 80 percent of operating costs, or $25,200 of $31,500 from tuition.

Chapter Four
Societal Forces Affecting Teleconferencing Use

The technology and costs of teleconferencing are only part of the jigsaw pattern of forces that will form future uses of these media. Specific applications of teleconferencing vary broadly, depending largely on the characteristics of the educational environment and competing resources where the system exists. But future uses of teleconferencing will also be shaped by developments impinging on the world of postsecondary education--developments that could have considerable impact.

Of course, it is impossible to predict what societal developments will actually occur, let alone what effects these developments will have on educational teleconferencing. Rather, we intend to present an overview of some important societal forces, relying largely on existing research data.[1] This is "rough gauge" forecasting at best--not prediction. A better understanding of alternative ways in which educational teleconferencing could evolve is closely linked to understanding societal developments likely to influence which alternatives will actually occur.

The task of identifying societal trends that might influence teleconferencing in postsecondary education is imposing. An almost infinite array of possible societal developments might be imagined. Recognizing the subjectivity involved in identifying those which could actually have direct effects, we have selected a list of seven that are likely to be important to the development of teleconference usage in postsecondary education:

- Age distribution
- Household and family characteristics
- Geographic distribution
- State of the economy
- Work-related issues
- Travel patterns
- Social service changes

We will discuss each of these areas of change in capsule form, explore some of the possible effects of various changes on the use of teleconferencing in postsecondary education, and raise questions for further consideration.

AGE DISTRIBUTION

As the baby-boom generation grows older, the age distribution of the United States population will shift: by 1985 the 20- to 40-year-old age bracket will be the largest. Table 1 displays this changing age distribution, which indicates an increasing median age. (Further development of life extension sciences would, of course, increase this effect.)

TABLE 1
POPULATION DISTRIBUTION BY AGE

	1975		1985	
Age	Millions	Percent of population	Millions	Percent of population
Under 10	33.2	15.6	33.1	14.3
10-19	41.4	19.4	34.6	15.0
20-29	36.1	16.9	41.1	17.8
30-39	25.6	12.0	36.5	15.8
40-49	23.0	10.8	25.6	11.1
50-59	22.5	10.5	22.0	9.5
60-69	17.3	8.1	19.8	8.6
70+	14.3	6.7	18.1	7.9
TOTAL:	213.4		TOTAL: 230.8	

Source: U.S. Bureau of the Census, Current Population Reports; Institute for the Future projections.

Clearly, as the median age increases, U.S. society is likely to become more adult-oriented. By 1990 the under-18 population, which constituted 35.5 percent of the total in 1960, will shrink to 28 percent. The pool of traditional college-age students (18 to 21 years old) is also declining. The precise degree of this decline will be determined by the size of families to be produced by the baby-boom cohort. But college enrollments already reflect this trend, as well as an increase in enrollment of older and part-time students.[2]

Current patterns suggest that, if only by the force of sheer numbers, the baby-boom generation will raise the concerns of adulthood for public discussion. There is some evidence that the nature of the adult life cycle is already in flux: stable, lifelong careers are yielding to a dynamic of multiple careers; people are also more likely to have a succession of mates. The life questions of adulthood are not simple questions of focus; they are often basic questions of direction and purpose.

This large adult population with changing personal needs is likely to have strong interests in education--if it is offered on their own terms.[3] Teleconferencing media might offer the flexibility and accessibility needed to provide wide-ranging educational services to adults of various ages. Courses dealing with career changes, financial planning, single parenting, professional recertification, etc. could be offered via teleconference. The massive size of this age group indicates that they represent a large educational market--even if only segments of the group have direct educational needs compatible with the characteristics of teleconferencing.

QUESTIONS

- What proportion of adult learners will adapt well to the characteristics of educational teleconferencing?
- What types of teleconferencing facilities will be most attractive to potential adult learners?
- Will particular age groups (e.g., younger people) be more receptive to education via teleconference?

HOUSEHOLD AND FAMILY CHARACTERISTICS

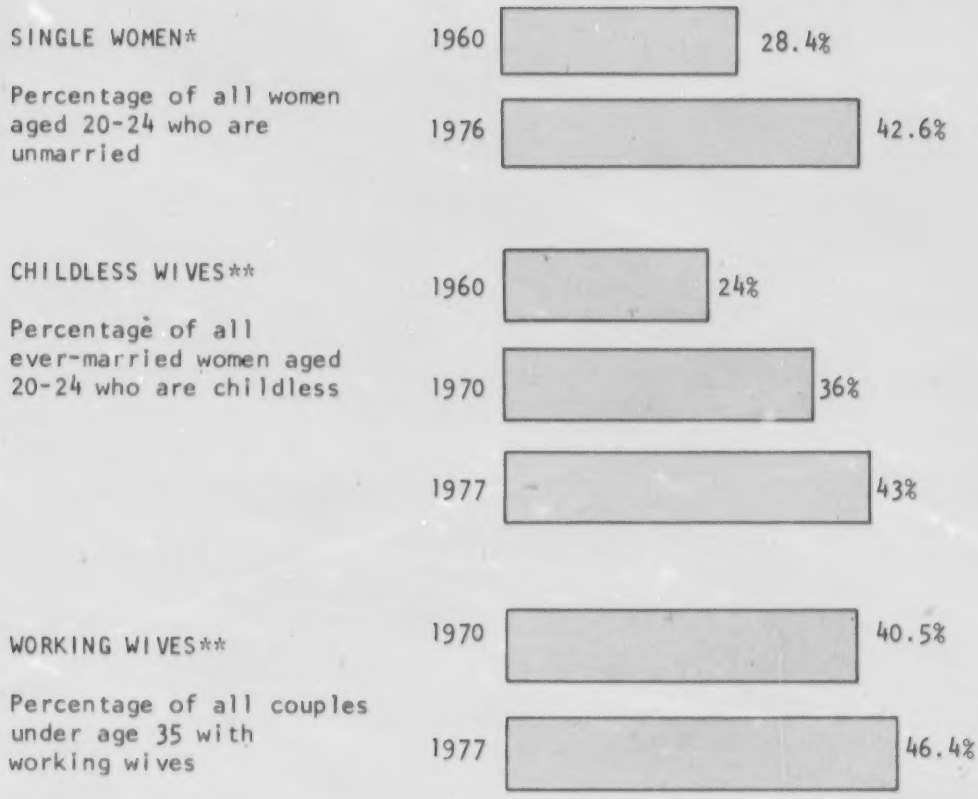
The number of separate households in the United States is likely to consistently increase in the near future. This growth in numbers of households will be spurred by population growth, particularly as the World War II baby-boom generation reaches the age of household formation, and by an apparent trend toward smaller household units. Factors contributing toward smaller household units are: delayed child-bearing, later marriages, high divorce rates, fewer "extended family" living arrangements, and growing numbers of single adults, both young and elderly. For example, by 1990 over 60 percent of all households in the United States may consist of only one or two persons.

The trend toward smaller households, combined with changing sex roles, contributes to new developments in family styles. Changing roles and expectations of women are at the core of this process, but the indirect effects on the roles of men could be equally important. Figure 5 shows the rather dramatic increases in numbers of single women, childless wives, and working wives between 1960 and 1973. Further increases appear likely, as more women enter the labor force and call for changes in the demands on their time that have traditionally come from marriage and child rearing. This trend implies a significant increase in the variety of family arrangements, as models are developed for two-career families, shared responsibility for child rearing, and other developments that will allow more flexibility in women's roles. Also, new two-earner families could have large increases in wages, which might allow freer spending for educational services.

As more women seek to enter the workforce, they will have strong educational needs (both before and after they start new jobs). Between 1970 and 1977, college enrollments of women (ages 25 to 34) tripled, from 400,000 to 1.3 million.[4] Working women are likely to be very busy, as many struggle to keep up with both work and family responsibilities. Teleconferencing might assist in providing the kind of flexibility needed to reach active men

FIGURE 5

CHANGING ROLES OF WOMEN



*"Population Profile of the United States: 1976," *Current Population Reports*, U.S. Bureau of the Census, series P-20, no. 307, April 1977. These figures are almost entirely determined by the behavior of the white majority. Black women are more likely to be single (53 percent of 20- to 24-year old black women were unmarried in 1975). Among black wives aged 24 to 29, the proportion who are childless has remained relatively constant over a 15-year period, hovering around 15 percent.

**"Population Profile of the United States: 1977," *Current Population Reports*, U.S. Bureau of the Census, series P-20, no. 324, April 1977. While both black and white couples registered an increase in the proportion of dual-earner families, the percentage of black couples with working wives is much higher than the percentage of white couples. In 1959, half of all black couples under 35 had working wives; by 1973, the proportion was 68 percent.

and women who have high interest but little time. Conference telephone calls or meetings at nearby conference rooms might save valuable travel time. Distantly located resource people could "attend" class meetings. Coordination with broadcast television, cassette tapes, or other media might extend the range of educational resources available in the home, while still providing the kind of interpersonal contact necessary for many types of learning.

QUESTIONS

- Can teleconferencing assist in providing student services for adult students (e.g., women's support groups, family counseling, job placement)?
- Will teleconferencing function well in degree-granting programs at various levels?
- Will home electronic devices (e.g., home computers, interactive television) be compatible with educational teleconferencing?

GEOGRAPHIC DISTRIBUTION

The 1970s marked a "watershed" in geographic distribution, as the century-long migration from rural areas to urban centers reversed. Many major urban centers began losing population; rural and semirural areas, on the other hand, showed strong rates of growth. The "small, big cities" (such as Fresno and Bakersfield, California; Austin, Texas) and primarily suburban counties are at the center of this growth trend, which is summarized in Table 2. This is not a simple "back to nature" movement. But the shift in population distribution from urban to previously rural or semirural areas may indicate a change in preferences and values.

TABLE 2

RESIDENCE OF U.S. POPULATION
BY TYPE OF AREA

	Annual average growth rates		
	1950-70	1970-74	1975-85
Major metropolitan	3.7%	0.7%	0.5%
Over 2,000,000	3.7	0.3	
500,000 to 1,999,999	3.7	1.4	
Minor metropolitan (50,000 to 499,000)	2.1	1.3	1.0
Nonmetropolitan (under 50,000)	-0.3	1.3	1.0
Total U.S.	2.0	1.0	0.8

Source: The Conference Board; U.S. Bureau of the Census; MIT/Harvard Joint Center for Urban Studies; Institute for the Future projections.

While trends toward living in nonurban areas of the United States can now be demonstrated, it is still not clear what these trends mean. Some suggest that this shift means an increase in the self-sufficiency of people of the United States. A recent report from SRI International, for instance, estimates that 4 to 5 million adults in the United States are already living a life of "voluntary simplicity," with another 8 to 10 million adults as partial practitioners, and one-third to one-half of the population as interested sympathizers.[5] Whether or not the geographic trends cited here are indicators of basic value changes is difficult to discern at the present time. An increased geographic dispersion of the population now seems certain, however, even though most educational institutions remain in urban areas.

This increasingly dispersed population seems well suited to high usage of teleconferencing media. Transplanted urbanites, for instance, will often

have large appetites for learning--probably far beyond the services traditionally offered in nonurban areas. In addition, they may be moving into new jobs that will necessitate retraining. Teleconferencing could quickly create an infrastructure for educational programs to a more widely dispersed student body. Urban and rural universities could broaden their outreach dramatically, instead of attempting to lure students to distantly located central or branch campuses.

QUESTIONS

- What types of educational services will be most important to geographically dispersed population groups?
- What proportion of local branch campus or community college activities could be conducted via teleconference?
- Could teleconferencing be used as a tool for community organizing among geographically dispersed populations?
- Can people from diverse cultural backgrounds communicate well over teleconferencing?

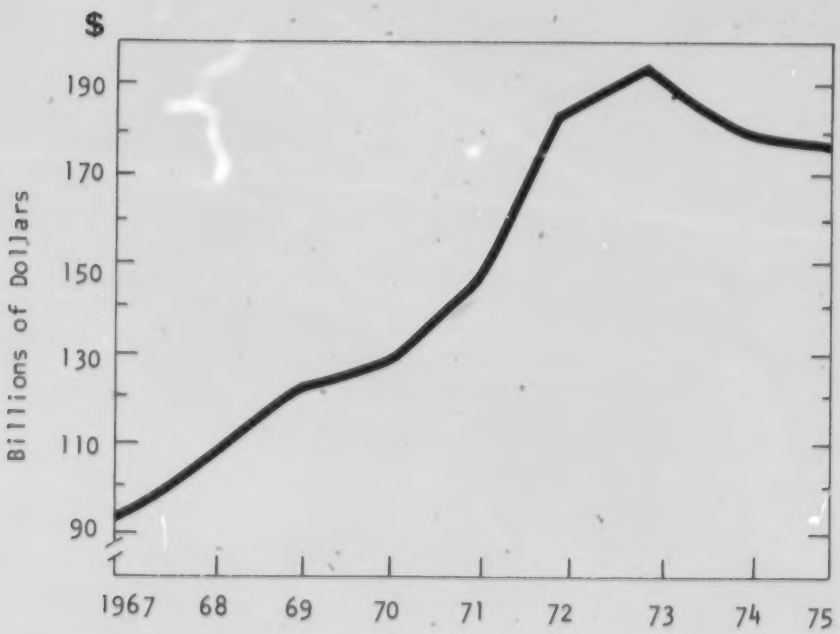
THE STATE OF THE ECONOMY

The state of the economy is probably the most important and the least predictable area of societal change. Forecasts of economic change over the next decade vary broadly, ranging from predictions of depression to a new affluence. The most common characteristic of these diverse views is their uncertainty; only the unwise speak without caution.

It is possible, however, to discuss several economic trends that have direct implications for teleconferencing usage in postsecondary education. The general consensus in this analysis is a slowly growing economy (the Institute's best bet on a "most likely" future is somewhere around 3 percent annual real growth in GNP over the next decade).

Figure 6 shows the changes in discretionary income in the United States between 1967 and 1974. Discretionary income, what is left from paychecks once all the bills are paid, is both highest and fastest-growing for smaller households. Given current trends toward small households--many with more than one earner--this distribution of discretionary income seems likely to continue.

FIGURE 6
TOTAL DISCRETIONARY INCOME



The relative number of very wealthy families and households (i.e., over $25,000 per year) is also likely to grow, as suggested in Table 3. Multi-earner families will have a major effect on this growth, especially as white wives enter the workforce and expand the incomes of white families. Poor

families, especially minorities, may not have these opportunities since wives are typically already employed. Thus, there is little to suggest that income distribution across economic classes and racial/ethnic groups will become more equal. In fact, the constrained economic mood is likely to prompt increased competition for shares.

TABLE 3

PERCENTAGE DISTRIBUTION OF HOUSEHOLDS AND FAMILIES BY INCOME CLASS: 1975 DOLLARS

Households			Families	
1975	1985	Income Class	1975	1985
20%	15%	Under $5,000	12%	8%
22	15	$5,000-10,000	21	14
20	20	$10,000-15,000	23	17
16	16	$15,000-20,000	18	17
10	14	$20,000-25,000	12	16
12	20	$25,000 and over	14	28

Source: IFTF projections based on data from the Bureau of Economic Analysis, U.S. Department of Commerce.

The effects of the state of the economy on the use of teleconferencing in postsecondary education can be interpreted in a number of ways. If the economy follows the slow-growth trends suggested above, one might speculate that teleconferencing will be seen as an efficient means of providing educational services. Teleconferencing technology can be quite consistent with fiscal constraint. A strong return to affluence, however, might invite the reinstatement of previously abandoned campuses and the use of more expensive technologies. Teleconferencing could be passed by, as it was in the last educational technology boom period. A serious depression, on the other hand, could engender a retrenchment mentality that would shun any innovation as too costly. Teleconferencing would only be feasible if it were seen as the best

way education could be provided *and* if support could be generated for trying a new idea in times of severe economic stress. Overall, we feel that economic slow growth or a steady state might be most favorable to the increased use of teleconferencing, assuming persuasive leadership for such a change were mounted.

QUESTIONS

- For those who can afford varied options, will teleconferencing prove attractive enough to be accepted?
- Will teleconferencing prove to be a significant source of income for educational institutions?
- Will teleconferencing be accepted in varying degrees by people of different socioeconomic classes? of different racial or ethnic groups?

WORK-RELATED ISSUES

The aging of the baby-boom generation and the increase of women workers will swell work force participation by 1990. The most significant general trend has been the move toward more service-sector jobs. Table 4 shows the historical emergence of the service sector, along with the proportionate decline of manufacturing activities. About 25 percent of today's population is employed as professional, technical, managerial, or administrative personnel--occupations that have traditionally required a college education.[6]

There is some question, however, about whether the shift to service-sector orientation will continue. Such a shift has been an underlying theme of the "postindustrial society" as presented by Daniel Bell, Herman Kahn, and others.[7] But there have also been some suggestions that the assumption that more service-sector jobs will continue to develop is premature. Michael Marien offers the following critique of what might be called the postindustrial assumption:

TABLE 4

DISTRIBUTION OF U.S. LABOR FORCE
BY INDUSTRIAL SECTORS

(Percentage distribution)

Industrial Sector	1930	1950	1970	1975
Manufacturing	32.2	33.7	27.2	23.6
Wholesale and retail trade	20.8	20.8	21.2	21.9
Government	10.8	13.3	17.7	19.8
Services	10.6	11.9	16.4	18.1
Transportation, public utilities	12.6	8.9	6.4	5.9
Finance, insurance, real estate	4.8	4.2	5.2	5.4
Contract construction	4.7	5.2	5.0	4.4
Mining	3.4	2.0	.9	.9

Source: U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1957* and *Continuation to 1962 and Revisions*, 1961 and 1965; *Statistical Abstract of the United States*, 1975.

The intellectual process by which this vision of the future has been arrived at appears to be devoid of any examination of alternative possibilities--what else might happen, or what else we could realistically aim for (ideals or goals). Rather, the service society has been generally promulgated with unqualified assertions that this will be our inexorable fate. Although little or nothing was said about the desirability of this trend, it was strongly implied to be the path of progress.[8]

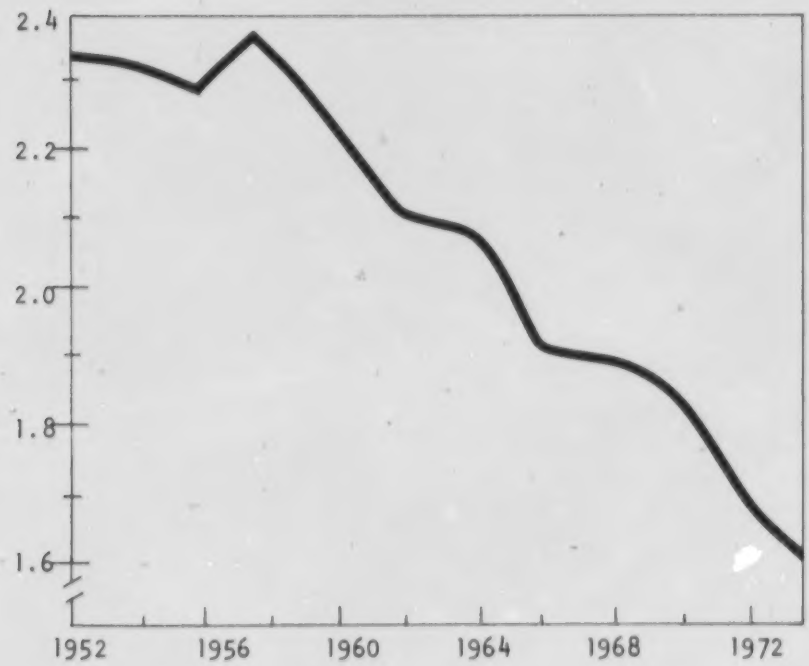
Marien argues that a "decentralist" orientation is emerging in the United States that may have direct effects on the growth of service-sector

jobs. Large, centralized, service-providing organizations may be questioned for their efficiency and desirability.[9] Smaller institutions with a stronger interest in self-sufficiency might emerge, possibly offering service-sector jobs on a different scale.

However service-sector jobs develop, it seems almost inevitable that a large number of well-educated persons will not be able to find jobs equal to their training. Figure 7 displays the core of the problem, which is rapidly becoming a kind of "good job squeeze." Educational institutions or other organizations will need to respond with more "work-related" training and more emphasis on learning to use resources and apply skills to a wide range of situations.

FIGURE 7

RATIO OF PROFESSIONAL AND MANAGERIAL JOBS
TO COLLEGE GRADUATES, 1952-1974



Source: Derived from Richard B. Freeman, *The Over-Educated American*, New York: Academic Press, 1976, p. 17.

There is little hope that unemployment rates will vary strongly in the near future. Even though unemployment rates are now approaching "acceptable" levels (under 5 percent), it is unlikely that unemployment problems will vanish. Furthermore, unemployment is not evenly distributed across the population. Since 1950, for instance, the unemployment rate for blacks has been double that of whites; since 1963, the unemployment rate of teenagers has been almost three times as high as the average. For black youth, unemployment ratios are about 40 percent in some areas, raising the possibility that "a whole generation of black youth is growing into adulthood without access to jobs, training, or skills."[10]

The uncertain picture of occupations in the future suggests little stability, continuing unemployment, and increasing underemployment. Personal work histories of individuals will ride the waves of these changes. More part-time work, more frequent career changes, earlier retirements, and later retirements are all probable. Teleconferencing might offer a means for meeting some of the changing educational needs of both job aspirants and those already employed who need new, more marketable skills. Educational programs sponsored by employers or unions, for instance, could be offered in the workplace or in the home.

It is not clear, however, how labor organizations will react to the concept of teleconferencing. Faculty are likely to fear that these media will reduce the need for teachers in postsecondary education. Other interest groups might argue that teleconferencing provides only "second rate" education and lobby for traditional face-to-face methods. The use of these media could become a volatile issue, even though--on the surface--they seem to provide the flexibility to assist in meeting the educational needs of a changing workforce environment.

QUESTIONS

- Will corporations make use of teleconferencing to provide educational services for their employees? Will labor unions use it?
- For what types of job training and skills development is teleconferencing best suited?

- Will skills in teaching by teleconference become an advantage for teachers looking for a job? What types of teachers will be attracted to educational teleconferencing? What types will resist it?

TRAVEL PATTERNS

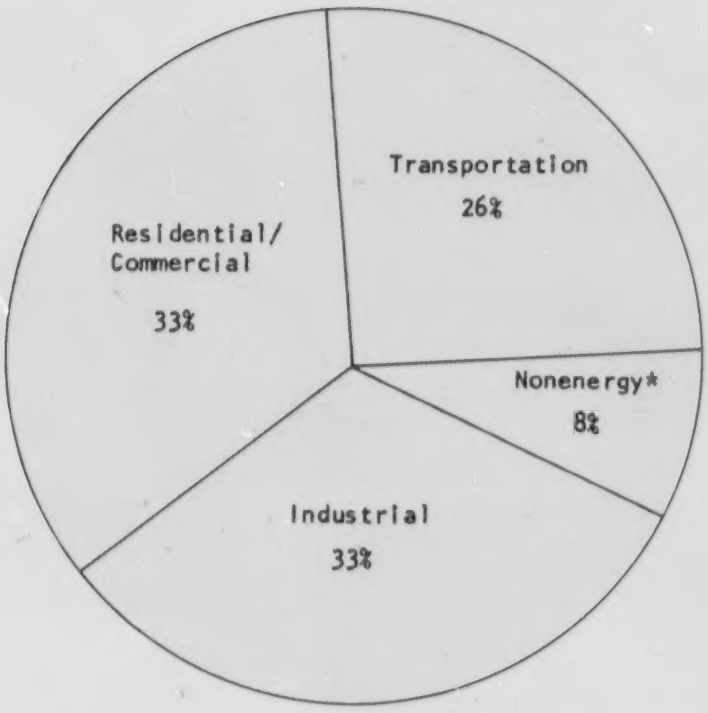
Energy and transportation are closely related areas that will be critical to the development and acceptance of teleconferencing over the next decade. A scarce-energy society searches for alternatives to travel; energy abundance encourages people to travel more. Forecasts of energy supply in the United States, however, are not simple to develop. For instance, OPEC controls vast amounts of the world's crude oil, and this source implies uncertainty. While gradually increasing prices are forseeable in the "most likely" future, the real possibility of a major war in the Middle East introduces significant potential for *much* higher prices. Within the United States, government policies toward regulation of energy play an important role in shaping the supply and demand for energy.

Currently, the transportation sector consumes about 26 percent of all energy used in the United States (see Figure 8). Of this amount, gasoline represents about two-thirds, primarily used in highway transportation by automobiles. In fact, over 75 percent of the energy consumed by the transportation sector is for highway transportation.

Gasoline prices will increase in approximate proportion to OPEC oil prices, which seem likely to be in the 9 percent range per year. This translates to a gradual rise to between $.90 and $1.10 per gallon of regular gas in the United States by 1985 (see Table 5).

FIGURE 8

U.S. ENERGY DEMAND SHARES



*Nonenergy uses includes feedstocks for petrochemicals, steel, etc.
Source: "Energy Outlook 1976-1990," booklet, Public Affairs Department, Houston, Texas, December 1975.

TABLE 5

PRICE PER GALLON, REGULAR GASOLINE

	PRICE	TAX	TOTAL
1977	$ .48	$ .12	$ .60
1985 A	.77	.12	.89
1985 B	.88	.12	1.00
1985 C	.94	.12	1.06

A @ 7% growth
B @ 9% growth
C @ 10% growth

Source: Institute for the Future estimate based upon *Statistical Abstract of the United States*, 1977, U.S. Bureau of the Census.

Finally, one point that is generally taken for granted is that there is no large-scale substitute for gasoline-powered (or petroleum-based) transport. At present and for the short term, this is probably true. However, rapid technological advancements in battery technology may make electric vehicles cost-competitive with some less efficient gasoline engines after 1985. Such a development might signal a new age of automobile use and, correspondingly, dependence. The degree of public support for mass transportation will also have a strong effect on transportation in general.

Teleconferencing and other advanced communication systems have been heralded by some (particularly developers) as a substitute for travel. Indeed, the literature is abundant with cost tradeoff observations and analyses.[11] Assuming rising costs for operating an automobile or for any other mode of transport, including airlines, how will this affect the relative attractiveness of teleconferencing?

From an economic standpoint, the desirability of teleconferencing would certainly increase with a major rise in travel costs. However, travel and teleconferencing are imperfect substitutes for each other; each is not like the other in the service or benefit it provides to its user. The use of teleconferencing instead of travel for a face-to-face meeting *redefines* the type of communication that occurs. There cannot be, except in limited cases, a simple substitution of communications for travel.

At some point, of course, travel could be curtailed due to prohibitive cost. However, in the absence of extreme crises, specific policies would need to be developed that required, or at least encouraged, the use of communications instead of travel. Simply introducing the option of teleconferencing does not mean that travel will decrease; people may even travel *more* to "meet" their new friends.

The decision to opt for teleconferencing is not solely an economic one and should not be viewed as such. Teleconferencing usage will be related in some way to real and perceived travel costs. The nature of this relationship is complex, however, and will require careful analysis of each specific teleconferencing application.

QUESTIONS

- There has been some tendency to associate energy conservation with avoidance of technology. Will "antitechnology" people adapt to teleconferencing?
- How important is face-to-face contact for each of the varied activities in postsecondary education? What are the activities for which teleconferencing is most likely to be effective?
- What policies would be most conducive to encouraging a successful balance between travel and communications for various segments of postsecondary education (e.g., travel restrictions, incentives for using telecommunications)?

SOCIAL SERVICE CHANGES

Postsecondary education is just one of many services that are competing for a limited number of public dollars. The so-called "taxpayers' revolt" signaled by California's Proposition 13 (and carried on by similar movements in Oregon, Michigan, and other states) can only intensify competition among various services. Proposals of important but expensive noneducational social programs (e.g., health insurance, full-employment legislation) put further pressure on postsecondary education to clearly justify its costs. The public mood regarding government expenditures is volatile at this point, and policies that emerge in the wake of the current resistance to taxes will be critical in determining the funding environment for postsecondary education in the 1980s.

Increased interest in the rights of the handicapped, especially as manifested in recent legislation, has already put pressure on educational institutions to respond better to the needs of this group. The innovative use of teleconferencing might directly assist in meeting personal and educational needs of the handicapped and the homebound.[12]

Teleconferencing may be viewed with increasing favor in a cost-conscious societal mood since it is an educational technology that can be employed at low to moderate costs. If cost-consciousness is also related to a desire for more decentralized governmental structure, teleconferencing could be viewed even more positively. However, as was discussed earlier in this report, the economics of using these media are still not fully demonstrated. And it must be remembered that teleconferencing is not a traditional item in educational budgets. In times of financial pressures, *any* items not currently in the budget--even if they are cost-effective--are likely to encounter resistance.

QUESTIONS

- What special relevance does teleconferencing have to the handicapped? Will handicapped people adapt well to use of teleconferencing?

- Will a movement toward fiscal conservatism discourage the use of innovations such as teleconferencing?
- Will educational institutions under severe constraints be open to trying innovations such as teleconferencing?
- Can teleconferencing prove to be cost-effective according to current methods of accounting and cost justification?

CONCLUSION

The societal developments summarized above are certainly not the only factors that will affect the evolution of teleconferencing in postsecondary education. They simply represent our judgment about developments that might be important. Readers should view this chapter critically, using these conclusions only as a general guide.

This chapter presents an uncertain picture of the next decade or so in the United States. Troubled periods seem almost inevitable--and likely to affect some groups more than others. However, the needs for effective postsecondary education seem high.

While our expectations of the likely effects of selected societal developments on teleconferencing usage suggest increasing use of these media, there are some serious qualifications to this conclusion. Faculty members fearing displacement by these technologies could have substantial influence in discouraging the use of teleconferencing media. Also, public reaction to the concept of teleconferencing could be negative enough to cancel the favorable effects likely to emerge from other trends.

Our own judgment is that the use of teleconferencing in postsecondary education will continue to increase, though not at the rate or in the fashion suggested by previous explorations of the potential for educational technology in general. As we suggested in Chapter One, there is a sense in which teleconferencing is met by a sort of "here-we-go-again" reaction,

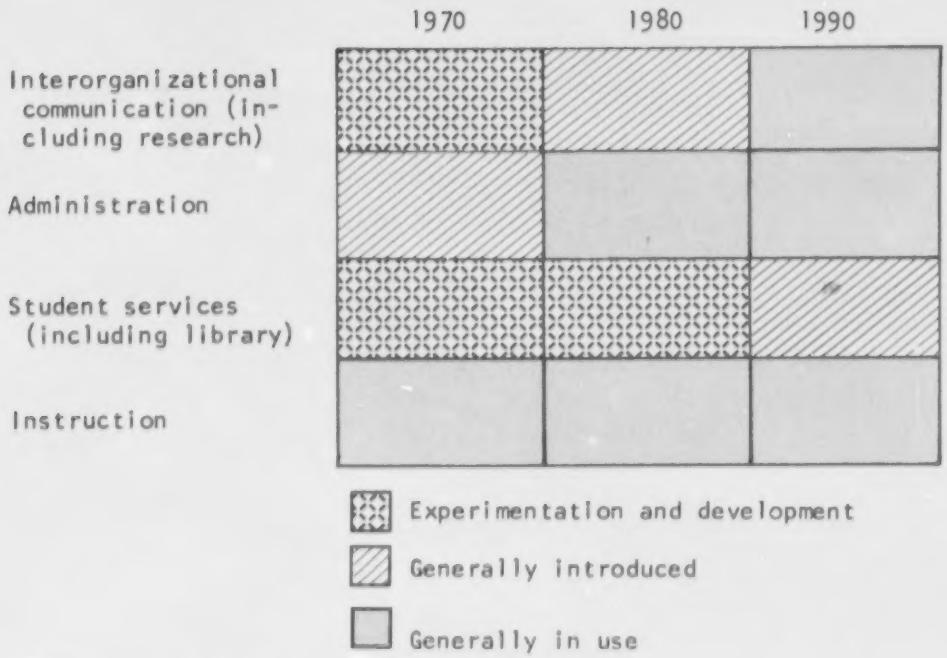
based on early failures or overselling of previous technology. Such a climate, coupled with economic uncertainty, suggests that the development of teleconferencing will probably proceed slowly, rather than as a large-scale movement.

The ways in which teleconferencing develops may also be different from previous experience with educational technology. In Chapter One of this report, we discussed the forecast of the Carnegie Commission that electronic technology in higher education would first be used in the research world, then administration, then libraries, and finally in instruction. Teleconferencing, however, appears to be developing in quite a different fashion, as shown in Figure 9. The first uses have been for instruction, with administration as the second most common usage. The utility of teleconferencing for research uses, included in our category of "interorganizational communication," has been explored more slowly. Library applications of teleconferencing, included in our category called "student services," have rarely been made. Admittedly, it is difficult to make direct comparisons with the Carnegie Commission Forecast because of varied definitions of terms. However, the general comparison is useful in distinguishing teleconferencing from the expectations noted for electronic technology in general.

While we do not expect the emergence of an "electronic world university" by the end of this century, we do anticipate a deep penetration in a limited number of specific areas (e.g., most professions, especially where "refresher" courses are required). Mixes of media are likely to increase in frequency, especially if new technologies are developed for exchanging written or visual information inexpensively. Noninstructional applications seem likely to develop more slowly, although the virtues of administrative uses could prove strong enough to hasten this pace. In short, teleconferencing is likely to play an important, though limited, role in postsecondary education as it gradually moves through the initial stages of its introduction.

FIGURE 9

ESTIMATED USE OF TELECONFERENCING
MEDIA IN POSTSECONDARY SETTINGS, 1970-1990



Source: Institute for the Future

NOTES

1. In particular, a 1977 study of societal developments affecting post-secondary education has been used as a basic source, with updated information gathered from current Institute for the Future projects. See Robert Johansen and Maureen McNulty, *Alternative Futures and Post-secondary Education in Pennsylvania*, Institute for the Future, Report R-39, July 1977.

2. See U.S. Bureau of the Census, "Population Profile of the U.S.: 1976," *Current Population Reports*, U.S. Government Printing Office, Series P-20, No. 307, 1977.

3. The high educational needs expected by the report of the Commission on Nontraditional Study could come closer to being a reality. See *Diversity by Design*, a report of the Commission on Nontraditional Study, San Francisco: Jossey-Bass Publishers, 1973.

4. U.S. Bureau of the Census, "Population Profile of the United States: 1977," *Current Population Reports*, Series P-20, No. 324, April 1978.

5. Duane Elgin and Arnold Mitchell, "Voluntary Simplicity (3)," *Coevolution Quarterly*, Summer 1977, pp. 10-11.

6. *Historical Statistics* and *Statistical Abstract of the United States*, 1975.

7. See, for instance, Daniel Bell, *The Coming Post-Industrial Society: A Venture in Social Forecasting*, New York: Basic Books, 1973; Herman Kahn, William Brown, and Leon Martel, *The Next 200 Years: A Scenario for America and the World*, New York: William Morrow, 1976.

8. Michael Marien, "The New Path of Progress and the Devolution of Services: Viewing the Present and Future without Industrial Era Bias," prepared for International Conference on the Service Sector of the Economy, Caribe Hilton Hotel, San Juan, Puerto Rico, June 25-July 1, 1978, to be published in *Social Policy*, September-October 1978, pp. 1-2. See also Michael Marien, "The Two Visions of Post-Industrial Society," *Futures*, October 1977, pp. 415-31.

9. Articulate decentralist critiques are already becoming quite popular. See, for instance, E. F. Schumacher, *Small Is Beautiful*, New York: Harper & Row, 1973.

10. Vernon E. Jordan, Jr., "Is Unemployment 'Desirable'?," *Saturday Review*, August 7, 1976, p. 15.

11. A major study of U.S. transportation through the year 2000 is now underway, with support from Congress. Called the National Transportation Policy Study Commission, they will also be doing a specific study of telecommunications implications for transportation. The final report is due in 1979. Probably the most comprehensive single source of information at the present time is the three-volume study by Richard Harkness, *Technology Assessment of Telecommunications/Transportation Interactions*, Volumes 1, 2, and 3, National Technical Information Service Nos. PB-272 694, 695, 696, Stanford Research Institute, Menlo Park, California, May 1977.

12. A significant amount of work has already been done regarding the use of telecommunications media by the handicapped, with financial support coming from the U.S. Department of Health, Education, and Welfare and other agencies. See, for instance, the six-volume set of reports done by the Mitre Corporation called *Telecommunications for Vocational Rehabilitation*, The Mitre Corporation, McLean, Virginia, Technical Report 7420, September 1977 and Richard P. Harland and Lois H. Adams, eds., *Telecommunications for Vocational Rehabilitation: A Systems Survey*, U.S. Department of Commerce, Office of Telecommunications, September 1977.

Chapter Five
Choices and Guidelines

Most of this report has focused on describing current teleconferencing activities in the world of postsecondary education and assessing future possibilities. This chapter moves from description and analysis to drawing operational conclusions, specifically directed toward practitioners of teleconferencing, both current and potential.

PREREQUISITES TO IMPLEMENTING TELECONFERENCING

Implementing a teleconferencing system in an educational setting involves certain initial choices. To facilitate the start-up process, we have outlined a set of conditions that are necessary--or at least highly desirable--*before* a teleconferencing system is introduced. These preconditions or prerequisites are intended to be a valid test of the potentials of teleconferencing in a given setting. Without meeting these prerequisites, any attempts at implementing a system will be severely constrained, and we doubt whether the potentials of teleconferencing can be adequately tested.

The experience with teleconferencing in postsecondary education to date, as reviewed in this report, suggests five basic prerequisites to implementation of a new system:

PREREQUISITES

1. Openness to trying out new technologies
2. Demonstrated need for educational services or expanded communication
3. Commitment of an effective advocate
4. Adequate start-up and continuing funding sources
5. Adequate accessibility of basic teleconferencing equipment and information

PREREQUISITE 1: Openness to trying out new technologies

The success of any technology depends to a great extent upon the proposed users' acceptance of it as a viable alternative to conventional methods. Overcoming possible reservations of institutional faculty, students, and administrators can pose serious difficulties in implementing innovative educational technologies.

Skepticism about new ventures that may further strain organizational budgets could be based in part on experience with previous educational technologies that were oversold or underutilized. Proposals of new capital outlay for teleconferencing equipment, training, and commitment of necessary personnel might meet considerable public opposition.

Faculty may be unwilling to give up autonomy or adopt new roles. The lack of widespread support and usage of new methods can be partly attributed to an ingrained tendency to do the same things in the same ways and to treat new technologies as gimmicks or playthings. Conventional educational delivery methods are generally labor-intensive. Instructors may be very resistant to implementing technological innovations that they fear would replace them or stimulate cutbacks in faculty time.

Student resistance may be somewhat less severe, given the technological sophistication of the present college-age population. Their experience with television, calculators, and video games may make this population more inclined to test out technological innovations. However, the reduced social contact in teleconference courses may be a major drawback for some student groups (for example, the elderly).

Prior gauging of potential users' openness to new technologies would aid in consideration of possible ways to alleviate initial resistance. Examining barriers and encouraging more openness to trying new methods could enhance the effective use of the technology once it has been implemented.

PREREQUISITE 2: Demonstrated need for educational services or expanded communications

Conventional educational structures have often failed to meet current educational needs. Working people, the handicapped, and the homebound may have particular constraints that prevent them from taking classes in a traditional setting. Since there are few competing services that already meet their specialized needs, teleconferencing could be the answer for many of these individuals.

The widespread use of teleconference programming for health-care professionals highlights this group's need for continuous updating of skills in rapidly changing fields. Professionals in the allied health sciences need access to the most current information in their particular specialties in order to best serve their clientele. In addition, strenuous hospital accreditation standards and professional relicensure and recertification requirements demand continuing education programs in this area.

However, health care is not the only field that has needs compatible with the characteristics of teleconference usage. Because time constraints of many busy professionals (such as lawyers and teachers) make full-time attendance at postsecondary institutions very difficult, teleconferencing is well suited to the needs of these groups. It can provide instruction in many specialties at convenient locations, while minimizing the necessity to take prolonged leaves or seriously interrupt busy schedules.

Such demonstrated, unmet needs for the type of services that teleconferencing could provide are an important starting point for consideration of a new system. If needs are not present, or are not yet recognized as being important, it is unlikely that a teleconferencing system will be greeted enthusiastically.

PREREQUISITE 3: Commitment of an effective advocate

Just as an environment conducive to testing out new technologies is vital to the successful implementation of a teleconferencing system, so is the role of the advocate. Effective leadership of an individual (or team) who will work for adequate continuing funding, ensure smooth technical operation, take responsibility for decision making, and promote good relations with the community is essential to a system's establishment and growth. Given the present dearth of easily accessible information on teleconferencing equipment, the work involved in tracking down data on equipment options and costs for an appropriate system requires considerable dedication. An advocate also has to be in a position to significantly influence organizational policy and be congenial enough to garner support for his efforts. Ineffective system advocates could, of course, actually discourage use.

Donald McNeil, University of Wisconsin Chancellor, and Lorne Parker, Project Coordinator, are credited with providing the impetus for the development of the Educational Telephone Network (ETN) at the University of Wisconsin-Extension in 1965. Dr. McNeil was primarily responsible for securing funding, while Dr. Parker coordinated the technical and organizational aspects of implementing the system. The use of the telephone for educational delivery in Wisconsin had begun as early as 1962 (the idea itself was conceived in the early 1950s). Coordination of efforts scattered throughout various departments led to the establishment of the network itself under the auspices of the University's Extension service. The success of the system in Wisconsin was in part contingent upon the cooperation of these advocates and the institutionalization of the use of telecommunications into a cohesive structure for educational delivery.

The Stephens College experience with educational teleconferencing provides a similar example of how important the advocate role can be in bringing a new innovation to a conventional academic setting. Professor James Burkhart of the Social Studies Department first proposed the use of conference calls to link several institutions (primarily small Southern colleges) with renowned scholars and political figures throughout the country. He has been credited with personally contacting members of Congress and national foundations to secure funds for implementation of this proposal. Although the Stephens system is no longer operational on a broad level (principally due to problems in securing continued funding), the foresight and initiative of an effective advocate enabled the college to implement its program in instructional teleconferencing.

It is easy to underplay the importance of an effective advocate and to assume that someone always "picks up the ball" once a new system gets underway. However, the charisma and dedication of a few individuals can make the difference between success and failure. We rarely observed a successful teleconferencing system without a clearly identifiable advocate or group of advocates--at least in the initial stages of operation.

PREREQUISITE 4: Adequate start-up and continuing funding sources

Our cost analysis of current applications of teleconferencing in post-secondary education (Chapter Three) revealed that many present systems relied on outside funding sources for initial start-ups. Few educational institutions have incorporated initial system installation into their own academic budgets or considered "hidden costs" such as personnel time required to prepare specialized course materials for teleconference programming. A major exception is professional medical associations, which have relied heavily on subscriber fees for both start-ups and the bulk of subsequent operational costs.

More and more organizations are competing for an increasingly limited share of funds. In a time of fiscal conservatism, government support may cease to be a major source of revenue for experimental programs of this

nature. Although a moderate level of success in existing systems may encourage initial funding from outside sources, much of the early excitement and novelty of teleconferencing may have already faded.

A reliance on outside funding also points up the problem of what happens to a teleconferencing system once the initial project funds are terminated. A number of systems in our survey did successfully make the transition to self-sufficiency. Yet user and subscriber fees may not be adequate to maintain operational and maintenance costs, especially if the clientele is disadvantaged. It is essential for viable systems to develop reliable revenue sources if they are to be financially and politically independent.

As systems become more sophisticated, some additional outlays for expansion and new equipment options might be necessary, and expenditures for more comprehensive evaluations and user training may also increase operational costs. Few organizations have incorporated teleconferencing systems as an ongoing budget item. Representatives of educational teleconferencing systems in the future may be forced to look more to their own organizations, not only for operational support but also as a source for initial development money. Whether or not an organization will fund teleconferencing as a regular budget item will depend to a great extent upon its commitment to the concept, its perception of the technology as an effective and necessary delivery mode for educational services, and a realistic expectation of its long-range cost-efficiency.

PREREQUISITE 5: Adequate accessibility of basic teleconferencing equipment and information

Most of the systems we surveyed indicated that information about teleconferencing equipment is woefully inadequate. Equipment suppliers seem to have only recently recognized and made conscious efforts to explore educational markets for teleconferencing equipment. Some respondents praised the efforts of certain smaller suppliers, while others lamented the lack of specific data available from representatives of the most obvious equipment sources--such as the telephone companies. There are few sources of objective information; suppliers may only stress the virtues of their own product lines.

Some teleconferencing equipment is provided through Bell System companies, but the preparation of local telephone company representatives regarding educational teleconferencing uses varies widely.

Only a few systems have been comprehensively documented and well publicized. There are very few experts in the educational community who can advise organizations considering teleconferencing, and it seems that the few good sources of advice are often overloaded with requests for information and assistance. (Our list of organizations using teleconferencing systems in "A Closer Look at Systems" will provide an initial resource for such information.)

Of course, some organizations will need access to more extensive information than will others. Certainly, there are a number of successful teleconferencing systems that were developed in spite of scant information and poor equipment. But many organizations will need completely reliable, off-the-shelf equipment and easily available guidance to succeed. Such organizations should probably delay a consideration of teleconferencing until both equipment and information sources become more highly evolved.

GUIDELINES FOR SUCCESSFUL OPERATION

The prerequisites described above are only initial considerations, designed to inform those interested in starting a teleconferencing system in a postsecondary educational setting. Once the decision to install a system has been made, a new set of concerns arises. The focus here is on optimizing or "getting the best out of teleconferencing."[1] Based on this study of teleconferencing in postsecondary education, we suggest the following guidelines for effective usage:

GUIDELINES

A. Develop specific programs introducing and building skills in teleconference usage

B. Consider both instructional and noninstructional potentials for teleconferencing

C. Explore possibilities for mixing varied communications media

D. Design and implement a procedure for assessing the economics of teleconferencing usage

E. Design and implement a systematic approach to evaluation

GUIDELINE A: Develop specific programs introducing and building skills in teleconference usage

Most teleconferencing systems have taken a very casual approach toward user training, including training of faculty in teleconference teaching skills. Of the 50 systems we contacted during this study, 40 had some kind of training program, but most of these were very limited (no more than a users' manual or a general teachers' guide). The assumption seems to be that there is very little to learn aside from turning a few knobs and switches.

However, many communication techniques that work well in a face-to-face meeting will be inadequate for a teleconference. Different ground rules apply for presenting information, encouraging student participation, and judging whether the message is "getting across." For instance, an experienced and animated professor may be used to giving 50-minute lectures that hold his students' attention. The same lecture might be extremely boring in an audio teleconference unless the professor develops varied presentation styles relevant to the sound-only medium. He might, for instance, encourage comments from remote locations or distribute handouts before the teleconference. An effective orientation to the use of these media by both instructors and students should stress the difference between classroom instruction

and teleconferencing, including the specific limitations of the media as they are used in varied classroom activities.

The University of Wisconsin-Extension's booklet *Teletechniques: Designing for Interactive Audio*[2] is certainly the most comprehensive guide currently available for teaching over audio teleconferencing systems. It provides practical suggestions for instructors on presentation styles, encouraging group participation, "humanizing" the teaching process, and getting feedback from participants. This how-to guide documents the procedures used at Wisconsin for introducing new faculty to teleconference teaching. Instructors are advised to provide variety in their presentation styles, as well as enough repetition to be sure ideas are getting across. They are given examples showing various methods that have been used to involve remote students in the discussion, including buzz groups, brainstorming, panels, role-playing, and group work sessions.

Educational applications of new technologies warrant investigation of new teaching/learning alternatives tailored to the specific media. Course content and student characteristics should also be considered in developing techniques suited to teleconferencing. The development of appropriate *learning skills* geared to the specific media employed can be a future focus for user training.[3] Orientation to the equipment should be very thorough; until the user becomes comfortable with the medium, participation could be frustrating. At present, equipment orientation serves as the principal emphasis in user training sessions for most teleconferencing systems. The distinctions between face-to-face instruction and delivery of educational information via electronic media have been virtually ignored.

Systematic analyses of the most appropriate teaching/learning techniques for use with these media may also provide some motivation for more comprehensive studies of the dynamics of conventional classroom teaching, which could expand our understanding of the learning process itself.

GUIDELINE B: Consider both instructional and noninstructional potentials for teleconferencing

Chapter Two of this report demonstrated clearly that there are many examples of instruction via teleconference. Noninstructional uses that might promote expanded utilization and cost-efficiency of a teleconferencing system are also worthy of exploration. Administrative meetings have been quite evident among current systems. But the use of teleconferencing for student services and interorganizational communication has received little attention.

Teleconferencing could help build communication networks among nonresident students. While telelecture participants may never meet other enrollees in face-to-face situations, the network has the potential to allow student-to-student communication outside the conventional classroom milieu. A simple exchange of phone numbers among students in telelecture courses could encourage group discussion sessions over the teleconference network. These sessions would be useful for students who may have common problems (such as understanding the course material or the lecturer's presentation and operating the equipment) that might be alleviated without the need to meet with the instructor. Such sessions might also inject a more cohesive group structure into the programming and encourage more participation in the telelecture itself by less articulate students.

One advantage of an audio-only network is that each individual's perceptions of other participants may be less clouded by prejudices than in face-to-face meetings. Prejudices are really expectations: members of specific races may be perceived as inferior; a quadraplegic person as helpless; a rural person as less well informed; an overweight or unattractive person as unappealing. When such prejudices are involved, the "disembodied voice" of an audio teleconference may actually provide some participants with a freedom or strength that they would not have in a face-to-face encounter. On the other hand, individuals with weak or unappealing voices may be at a disadvantage in an audio-only situation.

Teleconferencing systems could use electronic media effectively in providing student services. As mentioned earlier, many questions that are frequently asked in a registrar's office could be handled by teleconferencing.

While some services such as individual counseling may be best provided in person, if similar themes emerge with several students, a teleconference could be arranged with this group to answer questions and clear up common difficulties.

The potentials for teleconferencing usage in interorganizational communication are also considerable. Course sharing and exchange of research and educational resources among organizations serving similar constituencies could significantly expand the accessibility of postsecondary educational resources. A basically decentralized organization could make more efficient use of dispersed personnel by improving communications capabilities and alleviating travel expenses for meetings, conferences, and seminars. Expanded interorganizational uses of teleconferencing capabilities could open up exchanges of ideas and discussions of trends in many fields.

Teleconferencing use as a communication aid among practicing professionals could stimulate exchange of research information; "brainstorming" sessions could provide an impetus for new ideas and stimulate fresh debate on controversial issues. Professional consultations could also be effectively handled via teleconferencing.

The potential of teleconferencing for increasing public participation may be an added advantage. The Reading, Pennsylvania, experience with interactive cable makes a good case for the use of communication technology in increasing participation in government decision making by special interest groups and in acquainting citizens with the intricacies of government operations. Regional planning committees could more effectively gauge citizen response to new proposals by increasing community involvement in planning activities through the use of teleconferencing networks for "town meetings" or special issue forums, especially in remote areas where the local populace is widely dispersed and frequently not well informed on new public policy proposals.

The range of potential applications of teleconferencing in postsecondary education is only beginning to be explored. There are certainly areas where these media will *not* be effective, such as a crisis situation in which human contact is needed to build trust or ensure privacy. Yet a reasonable

guideline at this point seems to be to retain an open mind regarding applications beyond the more obvious potentials of instruction.

GUIDELINE C: Explore possibilities for mixing varied communications media

The majority of current teleconferencing systems have relied principally on audio teleconferencing combined with standard printed course materials and slides. More technologically sophisticated systems have added limited graphics capabilities, video equipment, or some computer resources. While audio teleconferencing may prove to be adequate for most educational uses, we suspect that over the next 10 years a number of new technologies for sending visual information inexpensively will be developed.[4] These new technologies could expand considerably the range of subjects that can be taught effectively via teleconference. Mixes of media, based on the educational needs of a given situation, seem to be the optimal approach.

Slow-scan television systems, called "slow-scan televideo," can be used with relatively inexpensive technology to provide a limited visual aid for audio teleconferencing. Cohen and Meyer describe it as follows:

> By sending as visual material only a sequence of *still* "snapshots," it is possible to use an *ordinary* telephone line of the sort represented to the hundreds of millions of U.S. installations currently available on a completely interconnectable basis.[5]

The Open University in Great Britain combines audio teleconferencing with broadcast television. Students watch specially prepared television programs augmented by brief teleconferences with a faculty member to discuss the issues raised by the program. A new British system, called Viewdata, could extend this approach considerably. Viewdata combines the use of television, telephone, and computers to provide home access to information bases. Open University faculty are currently studying possible educational applications of this new system.

Mixes of computer-based teleconferencing and computer programs can be used in a wide variety of ways, ranging from simple message sending and decision making to instruction. For instance, seminars can be held over the

medium with asynchronous discussions taking place between class meetings. Special computer terminals that allow handicapped students equal participation in educational activities are becoming available. And, of course, there is real potential for combining computer teleconferencing capabilities with computer-assisted instruction (CAI).

By far the majority of systems have relied upon the conventional educational paraphernalia common to traditional classroom settings to augment audio telelectures. Perhaps as technological developments in this field become more publicized and readily available, users will come to accept more and more combinations of media in telelectures. Development of more effective media mixes is likely to be a gradual process involving step-by-step acceptance of equipment options in response to expanding needs; this may in turn spur equipment providers to experiment with new options. The identification and consideration of appropriate mixes of media should be an essential component of teleconferencing operation and evaluation. Choosing the most desirable media mixes should be encouraged as early as possible in the evolution of a teleconferencing system.

GUIDELINE D: Design and implement a procedure for assessing the economics of teleconference usage

In our cost analysis of current teleconferencing applications in post-secondary education, we have emphasized the difficulties encountered in adequately measuring specific cost factors. Further problems are caused by the lack of standard cost measurements that can be applied uniformly over a variety of systems. Documentation of total costs involved in current teleconferencing systems is extremely difficult to sort out.

Expenditures for personnel, especially in university-affiliated systems, was identified as one of the most difficult cost factors to isolate. In fact, most systems don't know their personnel costs. Regular academic faculty members (as opposed to technical personnel) may receive little if any compensation for time spent preparing special course materials for teleconferencing use. Faculty time is usually a regular university budget item

that is not included in assessing costs for the operation of a teleconferencing system. In other types of teleconferencing systems, such as those operated by professional medical associations, these costs are more easily identified, as most telelecturers are specialists not regularly employed by the associations.

Sources of funds and operating costs, such as equipment, transmission or line charges, technical support staff, and maintenance, are all components that should be included in a specific cost analysis. Existing systems may have these items buried in various budget formulas. Isolating these factors as much as possible would allow determination of the cost efficiency of the entire system. Such a procedure would of course be easier if specific emphasis were placed on the importance of this aspect of system operation at the outset.

GUIDELINE E: Design and implement a systematic approach to evaluation

A comprehensive evaluation should be an integral part of a teleconferencing system from its inception. This evaluation should incorporate all aspects of system operation, including costs, user training and acceptance, effective and ineffective teaching styles, compatibility with the subject matter, accessibility, and the need for expansion or additional options. An effective system-wide evaluation and comparison of evaluations among programs can provide a more realistic picture of teleconferencing experiences for ongoing programs and a firmer basis for the implementation of new systems.

Evaluations of teleconferencing in postsecondary education have typically focused on the details of usage, such as student attitudes toward a specific course taught via teleconferencing. System-wide evaluations, or comparisons of different teleconferencing systems, have not been done systematically. The typical evaluation is a questionnaire survey conducted by the operators of the system. More sophisticated approaches to evaluation that involve independent evaluators or varied measurement techniques have been rare--largely because of the additional expense involved. Yet even

using a very informal definition, fewer than half of the organizations we contacted had conducted an "evaluation" of their teleconferencing activities.

Of course, evaluation of teleconferencing in postsecondary education is not an easy task. Teleconferencing media do not behave well as independent variables: it is difficult to isolate media effects from those related to personalities, group dynamics, substantive orientations, or other intervening variables. Under controlled laboratory conditions, such interrelated variables can be separated from each other.[6] But there are limits to how far one can go in evaluating educational teleconferencing through the use of laboratory experiments. At some point, people rightly ask how these media operate in actual practice.

Evaluations of teleconferencing in postsecondary education require a methodology that is flexible enough to gather information about the many facets of the group communication and learning processes. To rely *only* on questionnaires is insufficient since they tap only certain kinds of information and may be inadequate to understand what is happening when teleconferencing is used in an educational setting. Interviews, usage statistics, content analysis, and participant observation might all usefully be employed to better understand the dynamics of teleconference usage. Much information must be gathered about varied teaching styles, matching of medium and subject matter, ways in which students adapt to teleconferencing, the importance of various media mixes, and other issues.

Evaluation will be important for institutions using teleconferencing in order to answer the simple question, "Does it work?" The costs of teleconferencing will have to be justified, and a comprehensive evaluation will be necessary to understand what is happening--as well as how the system could be improved. A critical guideline is that effective evaluation tools be carefully designed and integrated with system operation.

CONCLUSION

The prerequisites and guidelines presented in this chapter are by no means all-inclusive. Teleconferencing usage in postsecondary education has

been too limited to justify finality in drawing operational conclusions. However, it is not too early to document current approaches and suggest alternatives. This chapter presents our conclusions based on this nine-month study; we invite the readers of this report to use it as a preface to drawing their own conclusions.

NOTES

1. While there have been few explorations to date of the operational issues of teleconferencing usage, certain exceptions are worthy of note. See Martin Elton and Sandy Hammond, *Getting the Best Out of Teleconferencing*, Communications Studies Group, London, England, Reference No. P/76075/HM; and Mavis Monson, *A Report Investigating Teleconferencing Teaching Techniques Used Over the Educational Telephone Network, University of Wisconsin-Extension*, University of Wisconsin-Extension, Madison, Wisconsin. A current study, funded by the National Science Foundation, is documenting the operational lessons of teleconferencing field trials. This report, due in late 1978, should be the most comprehensive study to date. Contact: Martin Elton or John Carey, Alternate Media Center, School of the Arts, New York University, 144 Bleecker Street, New York, NY.

2. Mavis Monson, "Designing for the Participants," *Journal of Communication*, vol. 28, no. 3, Summer 1978.

3. In a 1977 project, the Institute for the Future developed a "teleconferencing tutorial" which is a kind of simulation game intended to introduce novice users to the dynamics of group communication through electronic media. This tutorial, called "Spinoff," is available as an appendix to Robert Johansen et al., op. cit.

4. For a review of current technologies, see Stuart L. Meyer and David Brown, "A Review of Available Technology for Narrow-Band Transmission of Visual Material," *Biosciences Communications*, vol. 2, 1976, pp. 38-48.

5. William C. Cohen and Stuart L. Meyer, "Development of the Educational Uses of Slow-Scan Televideo," *Biosciences Communications*, vol. 1, 1975, pp. 169-83.

6. Some research has been done in controlled situations on the relative effectiveness of face-to-face lecture and telelecture. For instance, Blackwood and Trent randomly assigned a group of 71 students to either traditional learning situations or telephone instruction. On the basis of pre- and posttests given to both groups, they found no differences in amount of learning between the two groups. See Helen Blackwood and Curtis Trent, *A Comparison of the Effectiveness of Face-to-Face and Remote Teaching in Communicating Educational Information to Adults*, Cooperative Extension Service, Kansas State University, Manhattan, Kansas, ERIC ED 028-324, October 1968.

   Other similar studies at Los Angeles City College, the University of Missouri, West Virginia University, and the University of Wisconsin-Extension have had comparable results. Laboratory experiments have also been done to examine the efficiency of the telephone for communicating factual information. For an overview of these experiments, see Alex A. L. Reid, "Comparing Telephone with Face-to-Face Contact," in Ithiel de Sola Pool, ed., *The Social Impact of the Telephone*. These experiments have concluded that the telephone is at least as effective as face-to-face communication for basic information exchange. However, there are still basic questions about the degree to which these findings can be relied upon in designing teleconference teaching programs.

A Closer Look at Systems

ORGANIZATIONS USING TELECONFERENCING

IN POSTSECONDARY SETTINGS

Albany Medical College, Department of Post-Graduate Medicine, Albany, NY 12208, (518) 445-5302

Athabasca University, 14515 - 122 Avenue, Edmonton, Alberta T5L 2W4, Canada, (403) 452-9990

Berks Community Television, c/o Horizon Center, 40 N. 9th Street, Reading, PA 19601, (215) 374-3065

California Instructional Television Consortium, California State College, Sonoma, 1801 East Cotati Avenue, Rohnert Park, CA 94928, (707) 664-2517

California State University, Chico, Aymer J. Hamilton Building, Room 100, Chico, CA 95929, (916) 895-6116

California State University, Sacramento, 6000 J Street, Sacramento, CA 91819, (916) 454-6923

Carleton University, Ottawa, Ontario, Canada, (613) 231-4231

Center for Disease Control, Laboratory and Consultation Division, 1600 Clifton Road, Atlanta, GA 30333, (404) 633-3311

Colorado Association for Continuing Medical Education, Colorado Telenet Project, Mercy South, Suite 626, 1601 Milwaukee Street, Denver, CO 80206, (303) 321-1734

Communications in Learning, Inc., 2929 Main Street, Buffalo, NY 14214, (716) 837-7557

Control Data Corporation, 8100 - 34th Avenue South, Box 0, Minneapolis, MN 55440, (612) 853-8100

Delaware, University of, Division of Continuing Education, Wilcastle Center, 2800 Pennsylvania Avenue, Wilmington, DE 19806, (302) 738-8151

Earlham College, Biology Department, Richmond, IN 47374, (317) 962-6561

EDUCOM, P.O. Box 364, Princeton, NJ 08540, (609) 921-7575

Florida, University of, J. Hillis Miller Health Center, College of Pharmacy (Box J-4), Gainesville, FL 32610, (904) 392-4145

Illinois Institute of Technology, IIT/V, IIT Center, Chicago, IL 60616, (312) 567-3000

Illinois State University, College of Continuing Education and Public Service, Hovey Hall, Normal, IL 61761, (309) 438-8691

Illinois, University of, Champaign/Urbana, 62 Mumford Hall, Urbana, IL 61801, (217) 333-7117

Indiana Higher Education Telecommunication System, 1100 W. Michigan, Indianapolis, IN 46202, (317) 264-7945

Iowa Council of Area School Boards, 815 Savings and Loan Building, Des Moines, IA 50309, (515), 282-2195

Kansas Regents Continuing Education Network, Kansas State University, Division of Continuing Education, 308 Umberger Hall, Manhattan, KS 66506, (913) 532-5566

Kirkwood Community College, 6301 Kirkwood Blvd., SW, P.O. Box 2068, Cedar Rapids, IA 52406, (319) 398-5512

Los Angeles City College, 855 N. Vermont Avenue, Los Angeles, CA 90029, (213) 663-9141

Memorial University of Newfoundland, St. John's, Newfoundland A1B, 3V6, Canada, (709) 737-6654

Maine, University of, Bureau of Continuing Education for Nursing, School of Nursing, Portland Campus, 96 Falmouth Street, Portland, ME 04103, (207) 773-2981

Michigan, University of, CRLT, 109 E. Madison, Ann Arbor, MI 48104, (313) 764-1817

Minnesota, University of, Agricultural Extension Service, Institute of Agriculture, Forestry and Home Economics, St. Paul, MN 55108, (612) 373-1231

Missouri, University of, Columbia, B-4, Whitten Hall, Columbia, MO 65201, (314) 882-2121

New Jersey Institute of Technology, 323 High Street, Newark, NJ 07102, (201) 645-2352

North Dakota University, Office of Educational Resources, School of Medicine, Room 604, United Hospital (North Unity), Grand Forks, ND 58202, (701) 777-3894

Northwestern University, Graduate School of Management, Nathaniel Leverone Hall 5-210, Evanston, IL 60201, (312) 492-3561

Ohio State University, College of Medicine, 320 W. Tenth Avenue, Columbus, OH 43210, (614) 442-4985

Oklahoma Hospital Shared Services (Central), 2409 Broadway, Oklahoma City, OK 73103, (405) 525-8991

Oklahoma Hospital Shared Services (Northwest), 309 N. Grand, Enid, OK 73701, (405) 332-2323

Oklahoma Hospital Shared Services (Southwest), P.O. Box 148, Lawton, OK 73501, (405) 357-5066

Oklahoma State Regents for Higher Education, 500 Education Building, State Capitol Complex, Oklahoma City, OK 73105, (405) 521-2444

Open University, Faculty of Technology, Walton Hall, Milton Keynes MK7 6AA, England, Milton Keynes 63924

PEACESAT, Center for South Pacific Studies, University of California, Santa Cruz, CA 95064, (408) 429-2191

Pennsylvania State University Coordinating Council, 501 Teller Building, University Park, PA 16802, (814) 865-1346

Public Service Commission, Room 762, 300 Laurier, Ottawa, Ontario K1A 0M7, Canada (613) 992-0093

Public Service Satellite Consortium, 4040 Sorrento Valley Boulevard, San Diego, CA 92121, (714) 452-1140

Quebec, University of, Télé-université, 3108, chemin Sainte-Foy, Sainte-Foy, Quebec G1X 1P8, Canada, (418) 657-2670

Roche Laboratories, Department of Communications Development, Nutley, NJ 07110, (201) 235-2985

Stephens College, Columbia, MO 65201, (314) 449-1014

Syracuse University, Project Advance, 759 Ostrum, Syracuse, NY 13210, (315) 423-2301

Tennessee, University of, 121 Perkins Hall, Knoxville, TN 37961, (615) 974-2454

Texas Hospital Association, 6225 U.S. Highway 290 East, P.O. Box 15587, Austin, TX 78761, (512) 453-7204

Texas, University of, Health Science Center at San Antonio, 7703 Floyd Curl Drive, San Antonio, TX 78284, (512) 696-6295

Utah State University, Media Production Division, MLLAP UMC 30, Logan, UT 84322, (801) 752-4100

West Virginia University, School of Nursing, 1146 Medical Center, Morgantown, WV 26505, (304) 293-4917

Wisconsin-Extension, University of, Instructional Communications Systems, Radio Hall, Observatory Drive, Madison, WI 53706, (608) 262-4342

APPENDIX C
CHARACTERISTICS OF EXISTING SYSTEMS

Organization Year of system establishment	Type of agency	Methods of use	Participants: providers/users	Type of equipment	Mixes with other media	User training	Geographic area served
Albany Medical College 1955	Medical college	Instruction: continuing education	Health-care specialists Advisory Commitees --- Physicians Physical therapists Nurses Dieticians Radiological technicians	Audio: two-way radio SCA-FM VHF reception	Slides Charts Graphs Outlines Uses telephone lines in poor reception areas	Instruction manual Orientation for local conference moderators & technical assistants	Eastern New York Vermont Massachusetts New Hampshire Connecticut New Jersey
Athabasca University 1978	University	Instruction Support for packaged courses	Faculty --- Students (all non-resident)	Audio: Darome Convener	Texts Course outlines	System demonstration User manual Teacher training	Province of Alberta Canada
California Instructional Television Consortium 1978	Continuing education media specialists	Instruction: continuing education Administrative meetings Curriculum development	Faculty from Dominguez Hills & Sonoma --- Graduate & undergraduate students	Audio: Darome Convener	Video: broadcast TV programs	User manual Workshops	Northern California (statewide access proposed)
California State University, Chico 1973	University County school offices	Instruction: continuing education Student recruitment	Education Department Faculty --- Classroom teachers Graduate & high school students	Audio: speakerphone	TV Slides Charts Transparencies	System demonstration	Northeastern California
California State University, Sacramento 1972	University	Instruction Job interviews Administration	Faculty members Guest lecturers --- Students	Audio: Western Electric 50A	None	System demonstration	Sacramento, California
Center for Disease Control (CDC) 1975	U.S. government agency	Instruction	CDC's Bureau of Labs --- Laboratory personnel in hospitals & private labs	Audio: Darome Convener, Western Electric 50A	Slides Printed handouts	None	United States
Colorado Association for Continuing Medical Education 1978	Professional association	Instruction Information exchange Administrative meetings	Health-care specialists --- Health-care professionals	Audio: Darome Convener	Slides Transparencies	Regular training sessions (proposed)	Colorado

Organization Year of system establishment	Type of agency	Methods of use	Participants: providers/users	Type of equipment	Mixes with other media	User training	Geographic area served
Communications in Learning, Inc. 1968 (incorporated 1975)	Private, nonprofit media service group	Instruction	Physicians Nurses Administrators --- Health-care personnel College students	Audio: Darome Convener	Slides Printed handouts Audio tapes	System demonstration	New York Pennsylvania Ontario (Canada)
Delaware, University of 1977	University medical school	Instruction: continuing education	Center for Disease Control staff --- Clinical lab personnel in hospitals & private labs	Audio: Darome Convener	16mm slides	20–30 minute orientation sessions	Delaware
Florida, University of 1975	University health center	Instruction: continuing education	Pharmacy school faculty --- Foreign pharmacy school graduate students	Audio: Darome Convener	Printed handouts	System demonstration	Florida
Illinois State University 1977	University	Instruction Conferences Personnel meetings	Faculty members --- Graduate students	Audio: Darome Convener	Course syllabi Video cassettes	System demonstration Workshops	Central Illinois
Illinois, University of (Champaign/ Urbana) 1970	University extension	Information exchange Instruction Committee meetings Staff conferences	Extension faculty Engineering faculty --- Extension staff Engineering students Specialized audiences	Audio: Darome Convener, Western Electric 50A	Transparencies Slides Printed handouts Movies Electronic blackboard	System demonstration	Illinois
Indiana Higher Education Telecommunications System 1967	University association	Instruction Workshops Seminars Press conferences	Faculty from member institutions --- Students Professionals	Audio/Video: dial tandem phone network Teleresponse Closed-circuit switched TV	Radio Hardcopy message network Teleprocessing Audio/video tapes	Workshops	Indiana
Iowa Council of Area School Boards (ICASB) 1975	Association of community colleges & vocational training schools	Meetings Conferences Instruction	Area schools Department of Public Instruction ICASB personnel --- ICASB staff Students Department of Public Instruction	Audio: Western Electric 50A	Printed handouts	Instruction manual	Iowa

Organization Year of system establishment	Type of agency	Methods of use	Participants: providers/users	Type of equipment	Mixes with other media	User training	Geographic area served
Kansas Regents Continuing Education Network 1970	University association	Instruction Staff meetings Information exchange	Faculty from member universities Extension staff --- Public school teachers Graduate & undergraduate students	Audio: Western Electric 50A	Transparencies Printed handouts 35mm slides	Lecturer handbook Faculty orientation sessions	Kansas
Kirkwood Community College 1978	Community college	Instruction	College faculty --- Continuing education students Inmates	Audio: Darome Convener	Radio Printed handouts	User handbook Faculty workshops	Iowa
Los Angeles City College 1974	Community college	Instruction	Faculty --- Students County employees	Audio: Western Electric 50A	Printed handouts Slides	System demonstration	Los Angeles County, California
Maine, University of 1975	University	Instruction: continuing education	Health-care professionals --- Nurses	Audio: Western Electric 50A	Slides Printed handouts Charts Films Prerecorded tapes	System demonstration	Maine
Memorial University 1978	University medical school	Instruction Administrative meetings Patient care	Faculty --- Member hospital staff	Audio: Darome Convener	None	User manual	St. John's, Newfoundland (Canada)
Michigan, University of 1975	University	Seminars Committee meetings Conferences	System developers --- Faculty Students	Computer conferencing	Varied computer resources	User manual	Michigan
Minnesota, University of 1967	University extension service	Instruction Staff training Specialized audiences	Extension specialists --- Extension staff	Audio: Western Electric 50A	Experimented with cable TV Slides Audio tapes Overhead projectors Product samples	System demonstration	Minnesota
Missouri, University of 1969	University extension service	Instruction Information exchange	Faculty --- Extension staff Specialized audiences	Audio: amplified telephone	Slides Audio tapes SCA-FM	System demonstration	Missouri
New Jersey Institute of Technology 1974	University	Seminars Research Interorganizational communication	Researchers System developers --- Students Researchers	Computer conferencing	Varied computer resources	User Manual Resource people	United States (some Canadian & European users)

Organization Year of system establishment	Type of agency	Methods of use	Participants: providers/users	Type of equipment	Mixes with other media	User training	Geographic area served
North Dakota, University of 1976	University medical school	Instruction Administrative & faculty meetings	Medical school faculty Consulting specialists --- Nurses Allied health professionals Graduate & undergraduate students	Audio: Darome Convener	Slides Video Cassettes Graphs Charts Tapes	System demonstration	North Dakota
Northwestern University 1978	University	Instruction Information exchange	Extension specialists USDA personnel --- Extension agents Paraprofessionals Farmers Rural residents	Video: CSTV (controlled scan televideo)	None	None	Extension services of Universities of Massachusetts, Connecticut, Rhode Island
Ohio State University 1962	University medical school	Instruction	Medical school faculty --- Physicians Nurses Hospital staff	Audio: QKT voice coupler telephone	Slides Course outlines	User manual	Ohio Illinois Michigan Indiana Pennsylvania West Virginia Kansas Ontario (Canada)
Oklahoma Hospital Shared Services 1971 (Northwest) 1974 (Central) 1975 (Southwest)	Professional medical association	Instruction Information exchange Placing pharmaceutical orders	Health-care professionals --- Health-care professionals Patient groups	Audio: Darome Convener	35mm slides Printed handouts Course manuals Audio tapes	System demonstration	Oklahoma
Oklahoma State Regents for Higher Education 1970	University (State Coordinating Board)	Instruction	Faculty of member state universites --- Graduate & undergraduate students Industry employees	Video: closed-circuit microwave Audio: Darome Convener	"Talkback" telephone Slides Films Video tape recorder	System demonstration	Oklahoma
Open University 1973	University	Instruction Self-help groups Briefings Tutoring	Faculty Telephone tutors --- Students	Audio: amplified telephone	TV Radio Printed handouts	Faculty workshops	United Kingdom
PEACESAT (University of California, Santa Cruz terminal location, Center for South Pacific Studies) 1971	Satellite terminal location	Instruction (all levels, including continuing education) Information exchange Conferences	University personnel Community groups --- Communication researchers Community groups Health-care personnel	Audio: Satellite (ATS-1)	Slowscan televideo Electronic blackboard Telex	System demonstration	From Saipan, Trust Territories to Santa Cruz, California

Organization Year of system establishment	Type of agency	Methods of use	Participants: providers/users	Type of equipment	Mixes with other media	User training	Geographic area served
Pennsylvania State Coordinating Council 1973	Coordinating council	Instruction	Health-care professionals Hospital staffs (excluding physicians)	Audio: Western Electric 50A	Video cassettes Audio tapes	System demonstration	Pennsylvania
Public Service Commission 1974	Canadian government agency	Instruction Administrative meetings Information exchange	Public Service Commission Government employees (SDB)	Audio: Western Electric 50A, Dialogue, Bell Canada Companion 2	Facsimile Tape recorder Telex	System demonstration Audiovisual presentations	Canada
Quebec, University of 1973	University	Instruction Faculty & administrative meetings	Faculty Administrators Students	Audio: Western Electric 50A, Bell Canada Companion 2	None	User manual System demonstration	Territory of Quebec (Canada)
Reading, Pennsylvania (Berks County Community Television) 1975	Community consortium	Community service Limited instructional use	Local political figures Social Service agencies Senior citizens Senior citizens	Video: Interactive cable TV	Telephone call-ins	System demonstration Training of senior volunteers in operating video equipment	City of Reading & Berks County, Pennsylvania
Roche Laboratories 1976	Pharmaceutical manufacturer	Instruction Sales training Product symposia Technical assistance to field representatives	Roche management Sales staff Health-care professionals	Audio: Darome Convener	Slides Product samples Films Printed handouts	System demonstration User training sessions	United States
Spartanburg, South Carolina 1975	Experimental project	Instruction	Classroom teachers from Spartanburg Technical College GED students	Video: interactive cable TV	Printed handouts Telephone call-ins	System demonstration	Spartanburg, South Carolina
Stephens College 1958	College consortium	Instruction Information exchange	Stephens faculty Guest lecturers Students at Stephens & subscriber colleges	Audio: standard business conference calls with operator assistance	Printed handouts	None	Small colleges in Southeastern United States
Syracuse University, "Project Advance" 1977	University	Instruction Admissions information Seminars Workshops	"Adjunct" instructors Faculty High school students (for advanced college credit) Classroom teachers	Audio: Western Electric 50A	Printed handouts	Training conducted by phone company (New York Bell) Training manual	Massachusetts Michigan New York New Jersey

Organization Year of system establishment	Type of agency	Methods of use	Participants: providers/users	Type of equipment	Mixes with other media	User training	Geographic area served
Tennessee, University of, Knoxville 1966	College of engineering	Instruction	Engineering faculty Nonresident students (practicing engineers)	Audio: Speakerphone	Victor Electro-writer Video cassettes	System demonstration	Knoxville, Tennessee
Texas Hospital Association 1974	Professional medical association	Instruction: continuing education	THA staff Hospital employees (excluding physicians)	Audio: Western Electric 50A	None	Lecturer handbook	Texas
Texas, University of 1972	University health science center	Instruction: continuing education AHA updates Staff meetings Information exchange Public service programs	Health Center faculty Health-care professionals	Audio: Darome Convener	SCA-FM Slides Printed handouts Victor Electro-writer	System demonstration Workshops Seminars	Texas
Utah State University 1970	University extension service	Administrative, special topic, & extension service meetings Training sessions	Extension staff & specialists Extension staff Specialized audiences	Audio: Western Electric 50A Speakerphone	Slides Transparencies Printed handouts TV broadcasts	System demonstration	Utah
West Virginia University Medical Center 1970	University medical center	Instruction: continuing education	West Virginia nursing faculty Academic instructors Nurses Students	Audio: Western Electric 50A	None	System demonstration	West Virginia
Wisconsin-Extension, University of 1965	University extension service	Instruction Faculty meetings Information exchange Emergency updates Public service programs	Extension staff University faculty Extension staff Students Practicing professionals	Audio: Darome Convener	Victor Electro-writer SCA-FM Slides Printed handouts	System demonstration Workshops Seminars	Wisconsin

SYSTEM PROFILES

Because of the early state of development of teleconferencing use in postsecondary education, we chose to examine in greater detail those systems which might serve as prototypes for future efforts. We included in our sample at least one profile of each organizational type identified. The criteria for selecting these prototypes were:

- Length of system operation
- Size of user population
- Geographic location and population density
- Types of applications or functions
- University credit/noncredit
- Organizational structure
- Characteristics of user population
- Types of technology employed
- Availability of information

The case studies of systems chosen as prototypes appear in the order of system establishment, beginning with the earliest:

1958 Stephens College

1965 University of Wisconsin-Extension

1967 Indiana Higher Education Telecommunications System (IHETS)

1968 Communications in Learning, Inc. (CIL)

1970 West Virginia University Medical Center

1970 Kansas Regents Continuing Education Network

1970 University of Illinois (Champaign/Urbana)

1974 Texas Hospital Association (THA)

1974 Public Service Commission (Ottawa, Canada)

1975 Reading, Pennsylvania (Berks County Community Television)

1975 Center for Disease Control (CDC)

1976 Roche Laboratories

1978 Kirkwood Community College

STEPHENS COLLEGE

Dates of operation: 1958 to 1971

Background:

Stephens College in Columbia, Missouri had one of the first educational teleconferencing systems in the United States. In 1958 Dr. James Burkhart first proposed linking several institutions by conference telephone to share educational resources and to present prominent guest lecturers in different fields. More than 40 postsecondary institutions participated in the lecture series between 1963 and 1970, including several predominantly black colleges in the South. Guest lecturers included Robert Penn Warren, Imamu Amiri Baraka, Margaret Mead, and Senator Robert Taft.

This interorganizational telelecture series was abandoned in 1971. Stephens still uses teleconferencing to some extent, but not on as large a scale as previously. Usage is presently limited to Stephens faculty and students for alumnae organization meetings and occasional calls to guest lecturers.

Equipment and transmission:

The Stephens College network initially employed standard conference telephone calls with operator assistance. As usage expanded, portable conference telephones were installed at receiver locations (participating colleges in the Southeastern U.S.), linking them with a small central switchboard in a Stephens classroom. Transmission was via normal telephone lines. The quality of the reception was frequently poor and has been alluded to as a source of dissatisfaction among users.

Costs:

Each participating college paid an annual fee of $3,500 for equipment installation, telephone charges, honoraria, and program materials. Most of these funds were provided by outside grants and were not derived from institutional budgets. When government and private grants were cut back, especially at the black schools, the lecture series became an unaffordable luxury.

Usage:

Stephens College coordinated an interorganizational lecture series involving faculty and students from more than 40 small liberal arts colleges in the South. The program employed conference telephone calls linking these institutions with prominent literary and political figures nationwide.

A program coordinator or "master teacher" was the unofficial group leader for each program. The master teacher typically opened each session with an introduction of the lecturer and a brief synopsis of his or her major literary works or accomplishments and was also responsible for assisting the classroom teacher with facilitating interaction.

In order to add a visual reference to the audio-only format, Stephens provided slides and photographs of the guest lecturers to each participating institution prior to the telelectures.

Assessments:

No comprehensive evaluations were conducted during the course of the interorganizational lecture series at Stephens. Informal comments from users varied widely. Some Stephens faculty members expressed concern regarding the dominance of the master teacher. The transmission quality of the network was also considered by many to be a source of frustration during the early years of the network. Funding problems, however, have been considered the principal reason for abandonment of the telelecture series.

UNIVERSITY OF WISCONSIN-EXTENSION

Educational Telephone Network (ETN)
Statewide Educational Extension Network (SEEN)

Dates of operation: 1965 to the present

Background:

The concept of telephone teaching was envisioned by the University of Wisconsin in the early 1950s. The first classroom use of a telephone delivery method by the university was in a remote science lecture in 1962. Three years later, physicians were using traditional telephone conference circuits for general medical conferences.

The Educational Telephone Network (ETN) was established in 1965 with an operator initiating contacts. The University-Extension soon arranged to lease special telephone lines for its delivery system. By April 1966, 67 programs had been offered to an audience of 1,970 participants. Currently, the ETN system links 200 locations statewide. Wisconsin-Extension also operates a separate network, the Statewide Educational Extension Network (SEEN), which connects 35 of the ETN sites with additional equipment for transmitting graphics.

The University's mission (termed the Wisconsin Idea) was to extend "the boundaries of the campus to the boundaries of the state." The ETN has greatly alleviated the time and cost restraints involved in providing outreach services to nonresident students statewide.

Systemwide administrative guidelines were inititated by a faculty

group (the Anderson Committees) in 1969 and 1970 in order to ensure quality and effective operation and implementation of the ETN. The Anderson Committees are credited with providing the framework for expansion and growth of teleconferencing at the University of Wisconsin by:

- making sound, realistic programming recommendations;
- providing a mechanism to make faculty aware of the intricacies involved in programming on a teleconferencing system;
- reinforcing the extension instructional program teamwork concept, which joined subject-matter specialists with Community Extension Faculty and communications specialists to work together to provide quality, efficient educational programs throughout the state;
- developing pragmatic guidelines for the effective use of teleconferencing systems;
- serving as an awareness stage for Extension administrators, providing an overall plan for the administration to appropriately budget for the improvement of the systems;
- providing a system for in-depth involvement of outside expertise, such as telephone company personnel and state communities, to assist in the overall improvement of programs through technical systems and program design; and
- providing a basis for the development of new and improved technical communication systems.[1]

Equipment and transmission:

Earlier Wisconsin ETN teleconferencing experiments relied upon a system of conference bridging much like business conference calls,

using a standard desk-top speakerphone. Program expansion made the use of regular phone lines relying on operator assistance inadequate. Thus, a network of dedicated phone lines was implemented that provided exclusive ETN use and 24-hour accessibility.

From the conference call system, the ETN progressed to the use of a four-wire telephone with a Western Electric 106B speaker/amplifier at each station. This equipment had many technical shortcomings, including frequent disconnections when students attempted to pick up the handset to ask a question, line noise, and a general inadequacy for use with large audiences. The latter problem was solved temporarily by use of the "Webster Teletalk," which was a larger speaker/amplifier installed at locations that served large classes.

With the introduction of the Bell Telephone Company's 50A Portable Conference Telephone, the Wisconsin ETN system began using a modified version of this unit, which had been converted from a two-wire to a four-wire hookup. Although the 50A (which provides hands-free operation with two separate microphones) was considered an improvement over the regular handset, the small speaker and the fact that microphones could only be used one at a time limited adequate service to smaller audiences.

In 1973 following specifications and guidelines developed by ETN personnel and Wisconsin Bell representatives, Darome Inc. (Harvard, Illinois) developed prototype station equipment for the Wisconsin ETN system. The Darome Convener (Model 604) became the exclusive station equipment on the ETN and SEEN networks. The Darome 604 is a self-contained portable conference unit intended for use on private, voice-grade telephone circuits.[2] This amplification system was found to be adequate for high-quality sound to audiences of up to 300 students. The unit has four bidirectional microphones with long cords that can be placed around the classroom. Simple depression of a switch allows easy access and immediate response from participants. With the addition

of mixers (Darome Model 605), as many as 16 microphones can be connected to the unit, which can also be used as a public address system by feeding microphone signals to the receiver channel amplifier.

For ease of portability, an accompanying Darome Model 610 unit was developed for use with normal station equipment. The portable 610 model converts to a common, two-wire telephone circuit with voice-activated switching. Additional microphones can also be hooked up to the 610 by adding a Model 603 mixer.

The Statewide Educational Extension Network is similar to the ETN. SEEN links 35 of the 200 ETN sites with additional equipment to provide graphics capabilities. This equipment (the Victor Electrowriter) was developed by Victor Comptometer Company and was first used for instructional purposes in the late 1960s. The instructor writes on an electrowriter transmitter that picks up pen position and movement and carries these signals to receivers in SEEN classrooms. These signals are translated and reproduced by receivers at remote sites, then projected on a viewing screen.[3]

Transmission for both ETN and SEEN is via four-wire dedicated telephone lines leased through Wisconsin Bell.

Usage:

The University of Wisconsin-Extension's educational telephone network represents the most experienced, publicized, and heavily used teleconferencing system in the United States. More than 150 course series are offered annually with broadcasts to hospitals, libraries, county courthouses, and university campuses in 200 locations statewide. Program offerings encompass four general areas: continuing education, administrative programming, credit courses, and public service broadcasting.

The system serves primarily an instructional function with a cur-

rent total of 35,000 students. Figure 10 shows ETN enrollment and usage levels from 1965 to 1977. Wisconsin's approach to faculty training in telelecture techniques and its emphasis on "humanizing" telephone delivery methods are used extensively as a model for other networks.

Courses include graduate, undergraduate, and continuing education classes offered for university credit or continuing education units. Many continuing education courses are offered to practicing professionals (medicine, law, engineering, theology) to aid in compliance with relicensure and recertification requirements in various fields.

The network also serves an administrative function in coordinating the work of the state Extension Service staff. Several interesting interorganizational exchanges have also been facilitated by use of the network. A recent project involved the sharing of faculty resources in a graduate course between the University of Wisconsin and the University of Alabama.

Costs:

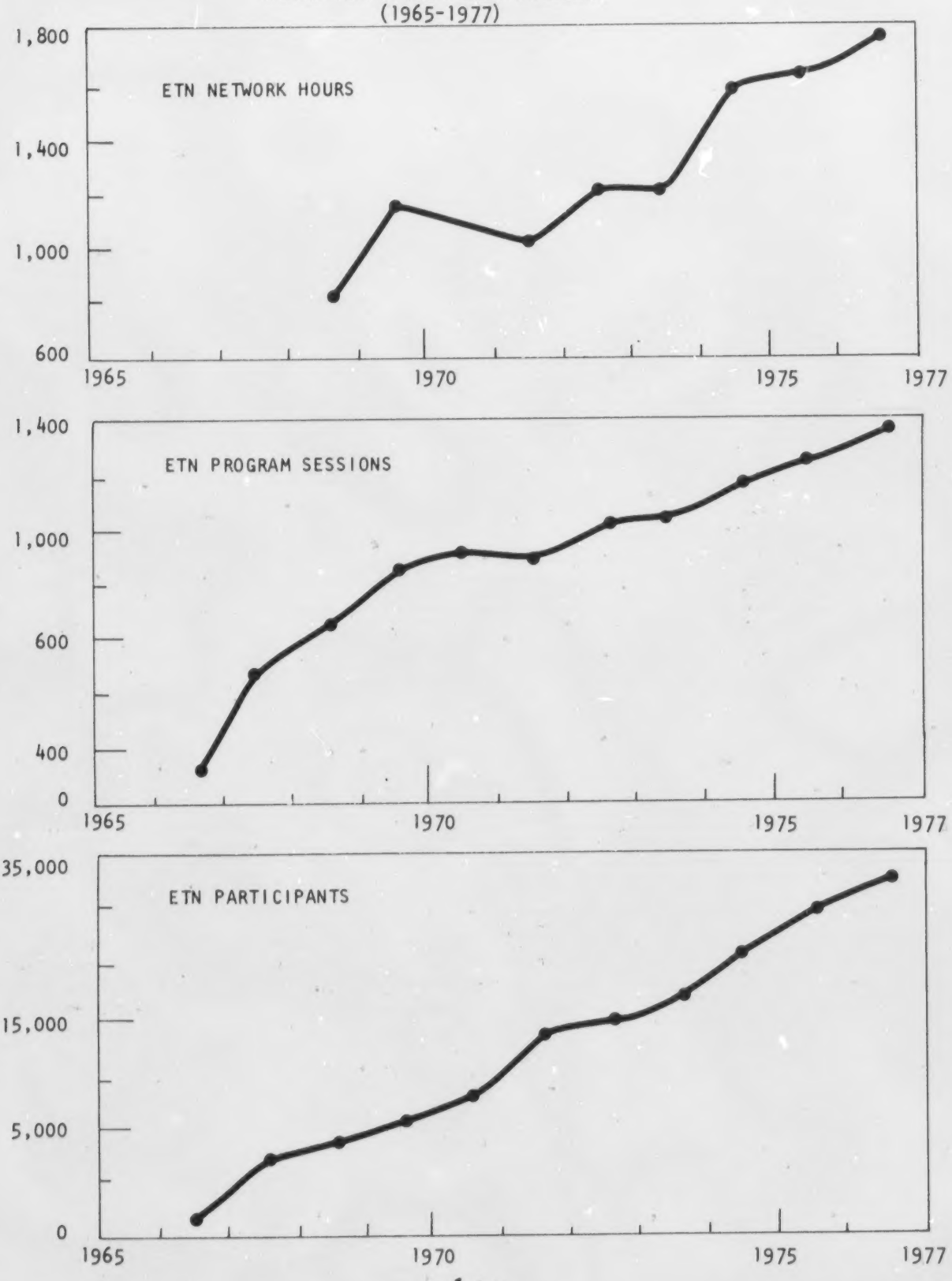
System administrators have estimated that the production costs for ETN programs average about 25¢ per student contact hour. This figure is based upon transmission, monthly equipment rental, and operational costs (excluding course material and faculty time).[4] System administrators estimate that average programming costs per student contact hour for SEEN programs total $17.[5] The annual budget for the SEEN network for the 1976-77 program year was estimated at $60,000. The ETN program operated on an estimated $325,000 for the same program year.

Assessments:

The University of Wisconsin-Extension employs a Program Evaluation Checklist (PEC) for courses on the ETN network. The PEC is designed to

FIGURE 10

UNIVERSITY OF WISCONSIN-EXTENSION
EDUCATIONAL TELEPHONE NETWORK
(1965-1977)



gauge user reactions regarding facilities, technical operations quality, lecturers' presentation, program content, materials, and organization. Results of the evaluations may be obtained by instructors and system administrators as a computer printout or an evaluation highlight prepared from the computer data.

Three methods are used to evaluate SEEN courses: a system survey of SEEN clientele conducted at three-year intervals, user surveys of particular SEEN courses, and spot evaluations conducted at random. Evaluations are used in the design of ETN and SEEN courses and to improve the quality of existing programs. Evaluation results have been largely favorable, and enrollments have shown a steady increase over the 13-year history of the network.

Notes:

1. Lorne Parker, "Teleconferencing as an Educational Medium: A Ten Year Perspective from the University of Wisconsin-Extension," *The Telephone in Education*, University of Wisconsin Press, Madison, 1976, p. 5.

2. Daryl Braun, Dennis Gilbertson and Henry C. Hansen, "ETN: A Technical System," *The Telephone in Education*, University of Wisconsin Press, Madison, 1976.

3. Op. cit., p. 12.

4. Lorne Parker and Marcia Baird, "Continuing Education by Telephone: A Party Line for Professionals," *Education and Training*, vol. 51, November 16, 1977.

5. Lowell Jackson, Lorne Parker, and Christine Olgren, "Teleconferencing + Telewriting = Continuing Engineering Education in Wisconsin," University of Wisconsin-Extension.

INDIANA HIGHER EDUCATION TELECOMMUNICATIONS SYSTEM

(IHETS)

Dates of operation: 1967 to the present

Background:

The Indiana Higher Education Telecommunications System is a multi-purpose, closed-circuit, statewide telecommunications network, intended to mobilize and share educational resources among its member institutions. In 1967 the Indiana legislature passed the Indiana Higher Education Telecommunications Act, authorizing the establishment of this multimedia network to be formed by an association including Ball State University, the Independent Colleges and Universities of Indiana, Inc., Indiana Vocational Technical College, Purdue University, and Vincennes University.

Administered by a special board of directors (with members from participating institutions), IHETS seeks to determine educational needs and to explore ways of meeting them through the most effective and innovative use of various educational/communications technologies. IHETS has outlined educational priorities in four general areas:

1. Communications--

   To operate communication networks interconnecting educational centers in Indiana and to facilitate the flow of messages along these channels.

2. Education--

   To assist users of the channels in employing the media for the most effective achievement of educational goals and to encourage use of the media planned within the broader context of the teaching-learning situation.

3. Cooperation--

   Through its total organization, to link the public and independent colleges and universities as well as the campuses of Indiana Vocational Technical College in a mutual effort to improve their educational programs and to aid in reaching a broad range of statewide educational constituencies.

4. Innovation and Change--

   To provide the human "networks" (committees, publications, telephone conferences, etc.) through which persons involved in higher education may devise creative solutions to educational problems and to manage change by collaborative planning.[1]

In previous years, educational institutions in Indiana experimented with interorganizational resource sharing via electronic media. Indiana and Purdue Universities established a two-way microwave network in the 1961-62 academic year to exchange institutional resources among their main campuses and regional campuses in Indianapolis; their microwave system linked three sites: Lafayette, Indianapolis, and Bloomington. The system was further expanded in 1967 to include satellite campuses of both institutions at the Indiana University Medical Center and at Fort Wayne, Purdue's regional campus in Hammond.

In 1967 the Indiana University School of Medicine made a proposal to the State General Assembly to establish an extended telecommunications network linking 20 teaching hospitals in the state. The network was envisioned as a means to provide more effective training for interns and as a continuing education resource for practicing physicians. This plan was approved by the Assembly in 1967. The budget outlay under this plan included the use of funds mandated by the Telecommunications Act for the development of IHETS. Vincennes University, Indiana Vocational Technical College, and the Independent Colleges and Universities of Indiana, Inc. were later to become full members of the expanding IHETS in 1971, 1972, and 1973 respectively.

Equipment and transmission:

The Indiana Higher Education Telecommunications System equipment can

best be described in terms of the audio and video media used.

Video Networks

The IHETS video network employs a closed-circuit microwave television system that links receiver locations statewide with six originator sites. System equipment is leased through three telephone companies (Indiana Bell, General Telephone, and AT&T). Talk-back capabilities were originally facilitated by telephone call-ins to the studio instructor. The delays involved in receiving calls provided the impetus for the subsequent use of Teleresponse (TR).

Teleresponse uses dedicated intercity telephone circuits rather than State University Voice Network (SUVON) lines, allowing a student to simply push a button to ask a question of the distant instructor.[2] The Teleresponse unit includes two telephone handsets, studio selector unit, and the TR line cord.[3]

The video network has six computer-controlled switching locations throughout the state, which allow the network to be reconfigurated to adapt to transmission needs. The IHETS Video network uses microwave transmission employing a 10 megahertz band of frequencies, 4.5 MHz of which are used for video and 6.6 MHz for program audio. When the total bandwidth is not required for television, the full bandwidth may be further fractioned into channels for high-speed data, high fidelity sound, and a number of voice-grade and teletype circuits.[4]

Cable lines are also used for the transmission of medical television programs to universities, colleges, and hospitals in the South Bend and Kokorno regions. Teleresponse units employ four-wire dedicated telephone lines for transmission of voice and signalling information.

IHETS also operates five Instructional Television Fixed Service (ITFS) systems, using signals transmitted via a series of 32 channels with frequencies of over 2500 MHz. These systems use two channels of a public television station near Dyer to transmit broadcasts to the

Calumet region, Evansville, Indianapolis, New Albany, and Vincennes/ Washington.

In order to provide for more efficient use of the video network and to alleviate scheduling conflicts, IHETS established a teleprocessing (TP) capability in 1972. Teleprocessing provides prerecording of programs on videocassettes for replay at convenient times. The system is automated (computer controlled) with decoders at specified locations to translate control signals that activate video taping equipment for recording or replay.

Voice Networks

The State University Voice Network primarily provides a communication link among public radio stations at five locations on state university campuses via a network of voice-grade telephone lines provided by IHETS. However, this dial tandem telephone network is capable of carrying any type of signal, including facsimile, teletype, and slow-speed data.

SUVON uses 200 inter- and intracity tie lines and off-premise stations to connect 69 campus switchboards through a central switching system (in Indianapolis). IHETS is currently setting up a voice conferencing network that will build on the Wisconsin experience with ETN and SEEN [5] and also envisions the development of a tape television system called Tele-Library.

Costs:

The Indiana legislature appropriated $2,500,000 for implementation of the original proposal to establish a network for medical programming. An additional $600,000 was appropriated under the Indiana Higher Educa-

tion Telecommunications Act of 1967. These funds provided the initial budget for the establishment of IHETS with a little less than $1,000,000 targeted for lease of telecommunications facilities from the telephone companies.

The shared-usage state Telpak system was designed to facilitate the bulk-buying of telephone lines. Previously, IHETS agencies had co-operated in the use of phone lines from the U.S. General Services Administration (GSA). When these lines became unavailable in 1974, the state Telpak system was established.

The Telpak agreement calls for block purchase of intrastate voice and data lines with costs prorated among users. There are four purchase sizes, and costs for each size are dependent upon the circuit capacity purchased.

TYPE	CAPACITY	COST PER MILE PER MONTH[6]
A	12 circuits	$15.00
B	24 circuits	$20.00
C	60 circuits	$25.00
D	240 circuits	$45.00

Since there is a fixed per mile/per month rate for each increment, the larger the number of circuits in use, the lower the cost per circuit. Other state agencies such as the Highway Commission and several local police departments also participate in the shared-usage Telpak system.

Usage:

IHETS is used to extend educational opportunities to a variety of clientele throughout Indiana. The multimedia approach to educational communications attracts a broad spectrum of students, including university and state college students as well as practicing professionals. Programming includes a variety of subject areas such as nuclear engineering, nutrition, music, astronomy, city planning,

and continuing medical education. Courses are offered for both graduate and undergraduate credits. Noncredit programming is offered primarily for professional upgrading for accountants, chemists, nurses, physicians, teachers, and university administrators.

IHETS also facilitates communications between "home" and satellite campuses of state higher educational institutions, as well as providing a convenient link for interinstitutional course and resource sharing. The first programming that involved two or more institutions was offered in 1972. The cooperation of several institutions in program development and the availability of statewide enrollment by use of IHETS can significantly reduce production costs.

Assessments:

No systemwide evaluations of the Indiana Network have been conducted. Each affiliated university employs user evaluations focusing on their program only.

Notes:

1. "IHETS: A Historical Overview," brochure, Indiana Higher Education Telecommunications System, Indianapolis, Indiana.
2. "Inter-Campus Instruction via Television: The IHETS Video Network," IHETS brochure.
3. "Teleresponse: New Instant Talkback," IHETS brochure.
4. Op. cit., p. 2.
5. "Computer Control of Teleconferencing," James R. Potter and James D. St. John, in Lorne Parker et al, *The Telephone in Education*, University of Wisconsin-Extension Press, Madison, 1977, p. 69.
6. "Getting a Rope Around Telephone Costs: The State Telpak System," IHETS brochure.

COMMUNICATIONS IN LEARNING, INC.

(CIL)

Dates of operation: 1968 to the present

Background:

Communications in Learning, Inc. is a private, nonprofit educational media service agency located in Buffalo, New York. CIL was designed as a telelecture network to provide continuing medical education programming to health-care agencies in the Niagara Frontier, Central New York, and portions of Pennsylvania and Ontario, Canada.

CIL services are categorized according to five areas:

- Tele-Lecture Network (TLN)
- CIL Press
- Center for Human Development
- Division of Research Services
- Division of Technical and Media Services

Program development, research, and media services are provided to member subscribers in health care, education, business, and government.

Equipment and transmission:

The CIL Tele-Lecture Network uses Darome Conveners with a two-wire bridge. Transmission is by the normal telephone network.

Costs:

Communications in Learning, Inc. markets medical continuing education programs in several fields. Programs are developed in packaged series that

deal with particular health-care topics. Typical costs for each series range from $140 to $350 per series. Individual programs average between $12 and $50.

Usage:

CIL provides continuing medical education programming to health-care professionals in hospitals, long-term care facilities, colleges, and universities. In its ten-year history, the network has presented more than 1,500 programs involving 2,600 physicians, nurses, administrators, and other health-care personnel as lecturers. Estimated enrollment for the 1978 program year includes more than 25,000 health-care personnel in over 200 programs. CIL's Tele-Lecture Network also offers courses for college credit in cooperation with postsecondary institutions within the region served by the system. Seminars and conferences are also conducted by CIL in consultation with professional organizations.

Program development is by CIL staff and health-care specialists. Programs are prerecorded on audio tapes and feature visual material on 35 mm slides. Amplified telephones facilitate interaction with over 450 lecturers in the health-care field who are available for presentations through the CIL network. CIL also serves as a distribution outlet for health-care programs developed by the federal Center for Disease Control in Atlanta, Georgia.

Research and media services are also available to member agencies. Representatives from subscriber institutions also serve as members of CIL's Tele-Lecture Advisory Board.

Assessments:

No systematic evaluations of CIL's Tele-Lecture Network programming have been undertaken to date, but one is planned.

WEST VIRGINIA UNIVERSITY MEDICAL CENTER

Dates of operation: 1970 to the present

Background:

During the late 1960s, West Virginia University's School of Nursing (Division of Continuing Education) proposed a statewide teleconferencing network to deliver continuing education courses to nurses and allied health-care workers throughout West Virginia. The impetus for providing such courses came in response to increasing certification requirements and the need to promote occupational advancement and update professional knowledge.

Because of its rugged, mountainous terrain and severe winters, West Virginia was determined to be an ideal testing ground for the idea of telelecture. Two-way audio teleconferencing was chosen as it was less expensive than video transmission and, unlike audio tapes, provided immediate two-way interaction.

A feasibility study was conducted during the 1970-71 academic year. The primary objectives of the study were:

1. To develop an effective, adequate, and feasible communications system for providing continuing nursing education opportunities between the West Virginia University School of Nursing, practicing nurses, and allied health workers throughout the state.

2. To plan, organize, and implement programs which will meet the continuing education needs of nursing and allied health workers in West Virginia.

3. To evaluate and perfect the established program to the point where it functions effectively.

4. To plan with a participating agency for on-going support for this activity after the termination of the Project.[1]

By spring 1971, project evaluators felt confident that the first three objectives had been accomplished. However, continued funding from the U.S. Department of Health, Education, and Welfare was necessary to continue operations until 1975.

Equipment and transmission:

The West Virginia University Medical Center's statewide teleconferencing network has a central broadcast facility located in the School of Nursing. The system utilizes four-wire dedicated telephone lines with amplified conference units (Western Electric 50A) at each of the 38 receiver sites.

Costs:

Initial developmental support for the West Virginia University telelecture network was provided in 1970 by a project grant from HEW.

In 1975 the system converted to a cost-sharing operation with member hospitals throughout the state. Each member agency pays an initial enrollment fee of $700. Installation charges (approximately $60) and rental of the conference unit ($25-30/month) are paid directly by each member to the local telephone company. Each nurse also pays a process and handling fee ($10) for each course in which he or she is enrolled.

Usage:

Continuing education course offerings are provided to nurses and allied health-care workers in 38 member hospitals statewide. Some courses are offered for academic credit but the majority provide nonacademic Continuing Education Units (CEU).

Course content is developed by faculty from the West Virginia University Medical Center and teaching consultants. Courses are determined by assessments of needs of nurses, current nursing and health knowledge, changing health-care delivery patterns, and consumer needs and demands.[2]

Additional telelectures are offered by the School of Pharmacy and the School of Social Work. The system coordinator works with instructors to assist them in adapting their teaching styles to the telelecture format. Course outlines and reference materials are provided at each site.

Assessments:

Systemwide evaluations were conducted during the initial development years (1970-75). Those evaluations were conducted under the direction of West Virginia University's College of Human Resources and Education (Educational Research and Field Services, ERFS). An evaluation model was implemented during the planning stages of the system to provide feedback for administrative decision making regarding "process" and "product."

Data were collected by ERFS staff from both the central project office and receiver locations. Extensive site visits were conducted that involved personal structured interviews with participating agency administrators, directors of nursing, and nursing unit supervisors. Direct observation and mailed questionnaires were also used to collect data from telelecture participants. In addition, during the 1974-75 program year, one course (pharmacology) was selected as being most indicative of learning requirements for nurses. Pre- and posttests were administered by telelecture to evaluate the performance of nurses enrolled in this particular course.

Notes:

1. David A. Puzzuoli and Charles J. Fazzaro, *The Development of Telelecture and Associated Media Systems for the Improvement of Nursing Education in West Virginia*, Morgantown, WV, 1971, provides detailed information about early phases of this project. Information for this study was supplied by Gearlean M. Slack, Project Director of HEW Project No. D10-NU-00431-01.

2. "The Telelecture System of Continuing Nursing Education," brochure, West Virginia University School of Nursing.

KANSAS REGENTS CONTINUING EDUCATION NETWORK

Dates of operation: 1970 to the present

Background:

The network began in the spring of 1970 when Kansas State University's Division of Continuing Education initiated a pilot program of community development with Hoxie, Kansas, utilizing conference phones and remote blackboard facilities. Credit courses were first offered the same summer. Classes were taught simultaneously at Kansas State University, Colby Community College, and Garden City Community Junior College, using a telephone amplification system leased from Southwestern Bell.[1]

By fall 1972, all six Regents schools (Emporia State, Fort Hays State, Kansas State, Pittsburg State, University of Kansas, and Wichita State University) were offering credit courses over the network.

Equipment and transmission:

The Kansas Regents Continuing Education Network uses dedicated telephone lines to link 28 locations statewide (see Figure 11) through an amplified voice system employing Western Electric 50A units. Audio telelectures are supplemented by the use of overhead transparencies, printed handout materials, and 35 mm slides.

Cost:

All network equipment is leased from Southwestern Bell. Line and equipment costs for 1979 are estimated at $44,000. Personnel costs, (excluding faculty time), are expected to total $41,804. Contractual costs and general operating expenses (including travel, supplies, printing, postage, new equipment, and phone service), totaled $25,694. The overall 1979

FIGURE 11

KANSAS REGENTS CONTINUING EDUCATION NETWORK

budget for operation of the system is $111,498.[2]

The network is largely self-supporting, with a basic commitment from each member institution of $16,083 per year. Remaining operational funding is expected from the sale of non-prime time program hours to other agencies.

Usage:

The Kansas Regents Network provides instruction for credit hours to both graduate and undergraduate students. Courses are offered in a variety of disciplines, including education, business, home economics, and the social sciences. Special classes are offered to high school students in the humanities and the natural sciences. The network also offers general enrichment and informational programs in real estate, inheritance taxes, and genealogy. Enrollment figures for the last full program year (1977-78) totaled 1200, with 19 different course offerings.

Faculty members from participating institutions and guest lecturers throughout the country provide program content. A lecturers' handbook is provided to instructors to give suggestions for effective presentation. A monitor is on duty at each location for a[illegible]ance with equipment operation.

The network is also used for dissemination of information by the state Cooperative Extension Service. The central office provides weekly updates on state crops during the summer months. The network is considering locating more remote terminals in county extension service offices, which will function in much the same way as the Wisconsin and Illinois systems.

Assessments:

At present, the Kansas network employs a user evaluation sheet for enrollees in each course offered over the system. It is designed to measure levels of satisfaction with course content, lecturers' presentations, supplementary materials, and general suggestions on possible improvement or revisions in future telelectures. Although a standard evaluation sheet is

used for each course, in the future, network operators plan to provide evaluation forms specifically designed for different courses.

The network itself has also been the focus for two doctoral theses.

Notes:

1. "A Brief History of the Network," brochure supplied by Kansas Regents Continuing Education Network.

2. "Projected Budget FY '79," Kansas Regents Continuing Education Network.

UNIVERSITY OF ILLINOIS (CHAMPAIGN/URBANA)

ILLINOIS TELENET

Dates of operation: 1970 to the present

Background:

The Illinois TeleNet began in the fall of 1970 with 17 locations scattered throughout the state. The first programming over the network included an administrative meeting and a statewide in-service workshop for Cooperative Extension staff conducted by a textile and clothing specialist. The TeleNet saved both travel time and expense by providing a convenient format that brings local audiences in contact with specialists in a variety of subject areas, including agriculture, home economics, and engineering.[1]

The Illinois TeleNet presently incorporates three separate systems, which can be interconnected into one 55-station network. One system links administrative offices of the State Cooperative Extension Service. A second system connects Region One (Northwest Illinois) Extension Service Offices only. The third system provides a communications link among other county extension offices throughout the state.

Equipment and transmission:

The Illinois TeleNet receiver stations are located in County Cooperative Extension Services offices. Each station has its own telephone amplification equipment.

The TeleNet has experimented with a variety of amplification equipment. Initially, Western Electric 106B speakers were used but these proved to be inadequate for large audiences. The necessity to permanently mount the speakers in receiver rooms resulted in conflicts in the use of space. By 1973

the Illinois TeleNet began experimenting with Western Electric Portable Conference units (50A) that had been converted to a four-wire format. However, most of these units (42 sites) have been replaced by Darome Conveners (Models 610 and 611).[2]

The TeleNet employs dial-up conference calls in addition to dedicated four-wire telephone lines for transmission.

Costs:

The first year's operating costs for the Illinois TeleNet were $23,000 for 17 stations, including installations. Operating expenditures for the 1977-78 program year were estimated at $6,500, roughly $118 per station. Equipment installation costs are $185 per station.

Each county office is assessed $25 per month for use of the system. User charges for program participation are left to the discretion of each participating county office.

Usage:

The Illinois TeleNet is used extensively for administrative purposes to provide a convenient communications link among State Cooperative Extension Service staff. Salary discussions, committee meetings, budget reviews, and personnel questions are all examples of administrative uses presently facilitated by the TeleNet. Periodic updates on state crops and exchange of information concerning disease outbreaks with suggested containment measures and economic consequences are provided by state specialists and out-of-state resource people.

The University of Illinois uses the TeleNet for instructional purposes in offering programming in a variety of subject areas to students throughout the state. University-Extension courses are generally noncredit offerings; however, some courses (primarily graduate level) are offered for university credit hours. Some in-service education courses are also offered

over the network to Cooperative Extension Service staff.

Instructional programming content is provided by extension specialists and various University of Illinois faculty members. Several designated extension staff members are available to assist instructors with suggestions for effective telelecture presentations and to orient new faculty users to system operation.

Assessments:

Little formal evaluation of the Illinois TeleNet has been undertaken. A few courses, however, do incorporate fairly extensive evaluation procedures. One example, beginning "Income Tax School," includes pre- and posttests, user attitude gauging, and user sessions with county advisors following completion of the course. However, most assessments are made for individual courses based upon user participation rates. Dwindling enrollments or lack of requests (for repetition or expansion of specific programs) may result in the elimination of specific offerings and classification of others as "unsuccessful." More systematic evaluations are planned for the 1978-79 program year, primarily in response to recent U.S. Department of Agriculture legislation.[3]

Notes:

1. "Teleconferencing in Extension--An Agricultural Economics Perspective," Edwin W. Vernon in *The Telephone in Education*, University of Wisconsin-Extension Press, Madison, 1977.

2. "Illinois TeleNet 70-76," Edwin W. Vernon in *The Telephone in Education*, 1976.

3. Response to IFTF inquiry, Edwin W. Vernon, University of Illinois.

TEXAS HOSPITAL ASSOCIATION

(THA)

Dates of operation: 1974 to the present

Background:

The Texas Hospital Association is a professional medical association with 29 member hospitals throughout the state. The Association's Telephone Information and Education System (TIES) provides convenient access to continuing medical education for health-care professionals in member hospitals.

Programming is based upon suggestions from user evaluations, medical updates on specific topics, and explanation of regulatory measures from the Joint Council on Accreditation of Hospitals (JCAH), Occupational Safety and Health Administration (OSHA), and Medicare training requirements.

Equipment and transmission:

The THA teleconferencing system uses Western Electric Portable Conference units (50A1). Each telelecture is recorded on audio cassettes for subsequent distribution to member hospitals for future use. Network transmission is via regular telephone lines.

Costs:

The annual operational budget for TIES is between $40- and 50,000. Each member hospital pays a standard fee of $55 per program, which includes administrative costs, audiovisual software, and long-distance conference call expenses. Each hospital is also responsible for installation and maintenance costs for their conference unit, including the cost of installing special jacks.

Usage:

Continuing medical education courses are offered to employees of member hospitals. Program content is provided by the Association staff and staff from member hospitals. Additional lecturers include representatives from affiliated professional speciality groups such as the American Cancer Society and the American Heart Association. A lecturer's information booklet based on the Wisconsin telelecture method is provided to give suggestions on effective presentation styles. Programming is augmented by use of 35 mm slides and printed handouts.

During the 1976-77 program year, THA reported 3,357 participants in TIES programs. This total amounted to an average enrollment of 115 hospital employees per program, which represents a 35 percent increase over the previous year's attendance.

In addition to programming for health-care personnel, the system provides special programming for hospital administrators and supervisory personnel. THA advisory committee meetings are sometimes held over the TIES system, but administrative use was reported as infrequent.

Assessments:

THA provides a user evaluation sheet for each telelecture participant. This evaluation sheet allows input from participants on their perceptions of the quality of a program and its utility for their work. Due to generally positive acceptance by users, THA plans to expand its TIES operation to reach more hospitals.

PUBLIC SERVICE COMMISSION

(OTTAWA, CANADA)

Dates of operation: 1974 to the present

Background:

The Canadian Public Service Commission's Staff Development Branch (SDB) is charged with providing professional, linguistic, and managerial training to over 20,000 civil servants throughout Canada. The SDB is decentralized into 12 regional locations. Rising travel and lodging costs for coordination of information, projects, and budgets were the primary impetus for the development of a teleconferencing system.

Equipment and transmission:

The Staff Development Branch currently uses three types of audio teleconferencing units: Dialogue, Western Electric Portable Conference Set (50A), and the Bell Canada Companion 2. All equipment has voice-switching capabilities, and transmission is through a network of leased telephone lines.

Costs:

The SDB provided the initial funding for the development of the teleconferencing system. Initial installation charges totalled less than $1,000. Although detailed cost figures are confidential, the system's operational budget is less than $15,000 per year, including equipment rental and line charges.

Usage:

Although the teleconferencing system is available to all branches of the Public Service Commission, heaviest users include the Staff Department,

Language, Audit, and Staffing Branches. The office of Native Employment is also a frequent user of the system. The Staff Development Branch takes responsibility for program development.

The network is used to facilitate the training of civil service employees. Because of the decentralized nature of SDB activities, the network is also used to coordinate projects, information, and decision making among the 12 regional offices.

Training courses in linguistics and management techniques are provided over the network, as well as project updates and budget reviews. Courses are not offered for credit, but to provide necessary job performance skills. The audio system is also used as a transmission network for facsimile; however, the two are not used concurrently. System demonstration and briefing sessions were employed as a training vehicle for users. New users receive instructional information, operation manuals, and assistance with system operation from the Corporate Systems and Services Branch.

Assessments:

Field studies, experimental sessions, and interviews with managerial personnel were conducted by Staff Development researchers as part of the initial needs assessment prior to system establishment. Organizational advantages associated with the use of teleconferencing were identified as follows:

- facilitates decentralization;
- brings together decision makers more quickly;
- increases regional participation;
- makes decision making with the regions faster and more flexible;
- improves communication, which improves staff morale;
- strengthens departmental organization;
- makes meetings independent of weather and other travel conditions;

- helps initiate communications between interested groups; and
- can be cost effective.[1]

At the time of this survey, system administrators indicated that a detailed cost analysis was presently underway.

Notes:

1. Glenn Barker, "Proposal for a Message Transmission Facility," *Teleconferencing for S.D.B. Administrative Purposes Phase II Needs Study*, Educational Feasibility Analysis Unit Staff Development Branch, Public Service Commission, Ottawa, Canada, March 12, 1976, p. 2.

READING, PENNSYLVANIA

(BERKS COMMUNITY TELEVISION)

Dates of operation: 1975 to the present

Background:

The Reading, Pennsylvania interactive cable television system was established as an experimental project in the public use of cable television. The experiment was designed to "test and evaluate the impact of two-way cable television on the delivery of public services to senior citizens."[1] The Reading site was selected for the project due to its high proportion of elderly residents (15.8 percent in 1970) and the availability of cable facilities.

The experiment was funded by the National Science Foundation and conducted by the NYU-Reading Consortium. The consortium included the Alternate Media Center of New York University, the ATC-Berks TV Cable Company, the City of Reading, the Berks County Senior Citizens Council, and the Reading Housing Authority. The four objectives of the project were:

1. to design and establish three neighborhood communication centers (NCCs), which were linked together by interactive cable television;
2. to train a staff of citizens to operate the interactive cable system;
3. to involve senior citizens and public agencies in the system's operation; and
4. to provide live two-way public service programming through which senior citizens could communicate with each other and with service delivery organizations.[2]

In early 1977, the system was turned over to a nonprofit community-based organization, Berks Community Television (BCTV), for continued operation and solicitation of sustaining funds.

Equipment and transmission:

Each Neighborhood Communication Center (NCC) was equipped with the following:

1. audio transmitting and receiving equipment
2. cameras
3. lens complement
4. camera mounting assemblies
5. switcher and synchronizing equipment
6. monitor and TV receiving equipment
7. RF receiving and transmitting equipment.[3]

Two GBC CTC-5000 viewfinder cameras were installed in each NCC with one used studio fashion (equipped with a zoom lens) and the other for titling purposes. Each viewfinder camera was mounted on a medium-weight tripod and dolly assembly. Between 2 and 6 microphones were used to pick up the audio signal (in the form of an FM carrier); lapel microphones (A 34L Shure) were used along with hand-held units (RE11 or EV 635). Switching, monitoring and receiving equipment included Sony SE6-1A units and Setchell-Carlson monitors/receivers.

The ATC-Berks TV Cable Company system is a 70-mile bidirectional, dual-trunk delivery system serving 35,000 subscribers with five low-band, 40 FM, seven highband, and two midband channels with a downstream bandwidth of 50-220 MHz.

Cost:

The Reading two-way cable system was established at a cost of $160,000--provided by an NSF grant. Equipment expenditures totaled $63,000 during the first eight months of operation. Personnel costs during this same period were $56,000. Subsequent operational costs for

the first year of service were $13,500. As local personnel became more technically experienced in operating the equipment, costs decreased substantially. Initially, operating costs were estimated at $326 per program hour. Cost estimates were based upon the program content and the level of participation. The average cost per program hour translated to $3.65 per participant hour (based on an average of 52 attendees at the NCCs and 30 home viewers for each program).

When system control was assumed by Berks Community Television, the monthly operating costs had declined to $8,300 per month, which included $6,500 for personnel and $1,800 for maintenance, telephone services, and technical assistance. Funds for BCTV's first year operational budget, which amounted to $150,249, were made up of voluntary contributions and funds provided under the state's Neighborhood Assistance Act.[4]

Extension of the cable programming to all 35,000 local subscribers added more home viewers, which reduced the average cost per participant hour to 32 cents.

Usage:

Programming is currently provided to 35,000 cable subscribers; a 1976 survey revealed that almost half (42 percent) the subscribers were elderly or had elderly persons living in their household. Senior citizens have been trained in television production techniques and operate the system with minimal technical assistance. Elderly residents are encouraged to appear on the network and to volunteer time or ideas for program production.

The system is used for social service information and referrals, entertainment, educational programming, and citizen-government interaction. Local political figures and representatives from social service

agencies appear regularly.

Informational programs emphasize local social services available to the elderly and call-ins from home viewers to give comments and ask questions about program content or to clarify specific eligibility requirements and application procedures. Local residents are afforded the opportunity to speak directly with social service personnel as well as local politicians regarding service delivery in their area.

Educational programming is geared to encourage interaction between the elderly and students in local schools. One program connected a local high school with senior citizens for an exchange of comments regarding the experience of Reading citizens during the Depression era.

Programs on nutrition and special exercises for the elderly are also scheduled frequently. Entertainment programs feature sing-a-longs, discussion groups, and quiz shows in which home viewers take an active part.

Assessments:

The NYU researchers viewed their role as catalysts in encouraging the development of a user-controlled network ultimately to be operated by local participants. Extensive evaluations were conducted on the utility and effect of the interactive cable system on service delivery in the Reading community. The researchers surveyed experimental and control groups on a before and after basis, dependent upon their access (or lack of access) to the two-way cable system.

Personal interviews and telephone and mail questionnaires were employed in addition to analysis of videotapes for program content. No conclusive results were documented on a possible increase in the use of public services facilitated by the interactive cable programming. Alternate Media Center researchers determined that levels of

service delivery were best reflected in increased knowledge and awareness of specific services gained by program participants and viewers.

Demonstrated progress was apparent in the increased interaction of senior citizens with local government officials. In addition, the system served an important function in encouraging peer group interaction among local elderly residents.

Notes:

1. Mitchell Moss, *Two-Way Cable Television: An Evaluation of Community Uses in Reading, Penn.; Summary,* NYU-Reading Consortium, New York University Alternate Media Center/School of Arts, April 1978, p. 1.

2. Ibid.

3. Gary Schober, "Technical Configuration of the Interactive System," in Mitchell Moss, *Two-Way Cable Television,* op. cit., p. 99.

4. Brochure, Berks Community Television, Reading, Pa.

CENTER FOR DISEASE CONTROL

(CDC)

Dates of operation: 1975 to the present

Background:

The Center for Disease Control is an agency of the federal government under the auspices of the U.S. Public Health Service. Although CDC does not operate an independent teleconferencing network, they began providing program content to established networks in 1975 in response to several requests for presentations.

CDC's Bureau of Laboratories (under its National Laboratories Improvement Program) is responsible for program content and development. Their main clients include the various state-level health departments although their teleconferencing activities extend to many established medically oriented teleconferencing systems nationwide. The Bureau of Laboratories' primary instructional purpose is to teach clinical chemistry.

Equipment and transmission:

The Center for Disease Control uses a Darome Convener for telelecture presentations. Most programs are recorded on audio tapes for dissemination to state health departments. A Western Electric 50A conference unit is also used occasionally for telelecture programs. Transmission is via regular phone lines.

Costs:

No detailed cost information was available, as CDC absorbs expenditures in its overall operational budget.

Usage:

CDC's Bureau of Laboratories develops and presents telelectures designed for laboratory personnel for state health departments, hospitals, and private laboratories throughout the U.S. Updates on medical topics are also provided through teleconferences. Lists of telelecture topics are made available to teleconference network coordinators, who may choose from a variety of programs to air over their respective networks. At present, over 25 new programs are developed each year for distribution. More than 125 lectures are offered annually to an estimated audience of 25,000 allied health-care workers nationwide.

Telelectures are accompanied by slides and printed handouts, which are provided to network coordinators prior to actual programming. Although no academic credit is offered by CDC, participating agencies may assign continuing education units (CEU) to various CDC programs.

Assessments:

To date, CDC has used no formal evaluation procedures. Comments on programming and suggestions for future topics are informally requested from participating agencies each year. The Center does plan to do extensive posttests of participants in various CDC telelectures during the next program year.

ROCHE LABORATORIES

Dates of operation: 1976 to the present

Background:

Roche Laboratories is a large pharmaceutical manufacturing firm located in Nutley, New Jersey. Two years ago, Roche's Department of Communication Development began experimenting with audio teleconferencing and has been operating their current system for a little over a year. The system was designed to provide for more productive use of internal resource people in communicating information to their field sales staff. It was also envisioned as a convenient and cost-efficient communication network for conferences, sales training, and rapid processing of marketing data from field representatives.

Equipment and transmission:

Roche employs a system of audio teleconferencing using Darome Conveners. Transmission via regular telephone lines allows flexibility in reaching a nationwide sales staff.

Costs:

A comprehensive cost analysis of the Roche system was not available. However, the Sales Department provided the initial funding, and group equipment rental was estimated at approximately $35 per month/per location.

Usage:

Roche Laboratories uses teleconferencing as a training and communication network for its field sales staff. Internal resource people and

outside consultants provide field represntatives with technical assistance, sales training, and information on product promotion. A recent national sales conference conducted via teleconferencing involved over 1,000 participants.

Roche also offers continuing education programming for health-care audiences, including physicians and nurses. No fees are charged to participating agencies for this programming. Pharmaceutical orders can also be placed over the network. Films, slides, and printed handouts are used to augment audio presentations.

Special training seminars have been conducted by Roche management to orient participants to effective use of audio teleconferencing equipment. A user's manual is also provided.

Assessment:

Many of the continuing medical education programs involve pre- and posttests, as well as telephone and mail surveys. Participant acceptance has been largely favorable, and the vast majority have indicated that they would like to participate in other courses via teleconference.

Programming for field sales representatives is evaluated by telephone conferences with participants and survey questionnaires conducted by a private firm.

KIRKWOOD COMMUNITY COLLEGE

(TLC System)

Dates of operation: January 1978 to the present

Background:

As a community college, Kirkwood sees its responsibility not only as providing quality education, but making it accessible to all people. The Kirkwood Telenetwork TLC (Talk, Listen, and Confer) System was designed to use advanced technologies to fulfill their educational goals.[1]

At present, Kirkwood's TLC System serves a seven-county area in Iowa, covering approximately 4,000 square miles, with a population of 330,000. Future plans envision integrating two other smaller counties in the system operation.

Equipment and transmission:

The TLC System uses a dedicated telephone line to link six locations through an amplified voice system employing Larome Conveners with a speaker and two microphones at each site. One class augments audio telelectures with use of the campus radio network. All other classes currently rely on two-way audio.

Costs:

The initial operating budget for the TLC System was $31,500. Initial equipment outlay for the six receiving stations totaled $5,000. Start-up funds were provided by the Community College, and 80 percent of the operating budget is expected to be recouped through tuition fees for student users.[2]

Usage:

The TLC System, administered by the Educational Services Division of the School of Education, provides both credit and noncredit courses in a variety of subjects including continuing education, occupational upgrading, self-development, and general enrichment. Student users include farmers, businessmen, health-care workers, housewives, and inmates at the Iowa State Men's Reformatory (one of the remote sites connected to the system).

Course content is provided by Kirkwood Community College faculty members. Two-way audio telelectures are currently augmented by printed handouts, and a monitor is on duty at each site to assist enrollees with operation of the equipment. The Educational Media Division and the Learning Resources Center can provide assistance to instructors who wish to use slides, transparencies, or audio tapes. They are also available to assist instructors with resource problems during course development.

A telelecture handbook is provided for instructors to assist with suggestions for effective presentation and techniques for eliciting interaction among remote sites. A two-day workshop for faculty members was also conducted by Dr. Lorne Parker of the University of Wisconsin-Extension as an orientation to the use of audio teleconferencing.

Assessments:

No current evaluations of the system (or individual courses) have been undertaken. At the time of this survey, the system had been operational for only three weeks. However, the Evaluation Services Division can provide forms for student and faculty feedback at the request of any telelecture instructor.

Notes:

1. "Education by Telelecture," brochure, Kirkwood Community College, Cedar Rapids, Iowa.

2. Response to IFTF questionnaire, Vernon R. Pickett, Associate Superintendent, Education Branch, Kirkwood Community College, Feb. 2, 1978.

Appendix
Methodology

We used a variety of means to gather information about current teleconferencing systems in postsecondary education: available literature, letter questionnaires, telephone interviews, resource persons, and--in some cases--onsite visits. Our questionnaire formats are included at the end of this Appendix. Conventional survey methodologies seemed to have a limited utility in this study since simple frequency of specific activities is not necessarily indicative of their scope. At an early stage of development in a relatively unexplored field, it is important to go beyond frequency counting to analysis of future directions.

To identify the systems, we began from lists published in *Telecoms Newsletter** and in previous Institute for the Future research. Other information sources such as NEXUS, ERIC, and SSIE (Smithsonian Scientific Information Exchange) were also searched, though they rarely identified new efforts. Since the formal literature on teleconferencing in postsecondary education is quite limited, we relied substantially on referrals from system representatives, advisory board members, and other individuals to identify current systems.

We identified about 75 organizations and contacted their representatives by telephone to verify that they actually had an operating teleconferencing system and were willing to provide information about their activities. During these initial telephone interviews, we requested all available printed information about each system. We then wrote system representatives, asking 10 open-ended questions that were intended to elicit specific categories of information, as well as to encourage elaboration on individual system characteristics. We thus collected packets

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* Published by University of Wisconsin-Extension, Radio Hall, Observatory Drive, Madison, WI 53706 (formerly *Telephone in Education Newsletter*).

of information about each system rather than just detailed questionnaires. Follow-up telephone calls and occasional site visits were used to fill in missing information--most extensively with the 13 prototype systems.

No strict format was used for site visits, which were only a minor part of the project. Typically, the project staff member met for three to five hours with the representative, completed questions on the system, collected printed materials, and visited the teleconferencing facility. Whenever possible, our staff member observed classes or meetings in progress. Because of the limitations of the project, only five systems were visited personally by an Institute staff member.

On the basis of these responses, we began a chart that characterizes each teleconferencing system according to several categories, including: the type of organization, methods of use, participants, type of equipment, etc. Our intent was to identify basic descriptive dimensions of teleconferencing in postsecondary education and to provide a framework for comparison of the various systems.

The methodology used in Chapter Four builds directly on previous work done at the Institute for the Future. A good part of the task involved defining and selecting societal trends that we felt had the greatest bearing on future uses of these media in postsecondary education. The project team reviewed the most recent trend data collected at the Institute and discussed possible implications with other Institute staff and our critics board. Members of the critics board included two individuals who have directed teleconferencing systems at large state universities for over a decade; a director of financial aid and student services administrator from a private university (who spends much of his time with minority, low-income, and handicapped students); a communications research specialist; and a social scientist who has specialized in policy and futures research.

The critics board reviewed an early draft of the entire report and individuals were consulted on subsequent versions of sections on which

they had expertise. Chapter Two, for example, was sent to several persons with broad experience in educational teleconferencing; they were asked to point out gaps or misinformation. In cases where new systems were mentioned, we contacted system representatives by telephone and administered our initial questionnaire and follow-up questions during the same call. Chapter Three was critiqued by three economists, one of whom had direct experience in cost-benefit analysis of educational technology.

The methodology of the project was thus a mixture of varied techniques, ranging from interviews to cost analysis. We felt that any single method (such as survey research) would have been too limited to explore both current and potential uses of teleconferencing in postsecondary education.

INTRODUCTION TO EXXON PROJECT

Initial Phone Contacts

Institute background

- Nonprofit, independent research institute
- Menlo Park, California
- General comments about types of projects, including mention of teleconferencing

Project title

- The Uses of Teleconferencing in Postsecondary Education
- Staff: Robert Johansen, Maureen McNulty, Barbara McNeal

Project objectives

- To collect and organize information about existing teleconferencing systems in postsecondary education
- To assess current and potential functions of teleconferencing in postsecondary education
- To explore the effects of likely societal developments on the uses of teleconferencing (in postsecondary education)
- To develop guidelines for the use of teleconferencing in post-secondary education

How institutions were chosen:

- Met our criteria: interactive system for group communication
  post-high school
  operational
- Who is most appropriate contact person from their institution (with whom should be we dealing in subsequent calls)?

What we need from them:

- Basic prepared materials
- Information on: participants
  substantive areas covered
  economics of the system
  evaluations or studies done
  geographic area of use
  methods of use (teaching, for example)
  mixes with other media
  type of institution (example: Do they have a formal campus?)
  equipment
  training
  administrative structure

We can send them written questions at this point or review packages of materials they send us--determine to which action they seem most receptive. We will send all contacts a follow-up letter and a description of the project. To those who would like to receive written questions, we will send additional pages. Inform each contact that we are likely to be in touch with them again (one of the three Institute staff members).

INSTITUTE FOR THE FUTURE
2740 Sand Hill Road Menlo Park CA 94025 (415) 854-6322

FOLLOW-UP LETTER

1. Who participates in the system? Who provides information? Who are the users?

2. For what purposes is the system used?

3. What does the teleconferencing system cost? What was the initial investment, and who provided it? What are operating costs?

4. What geographic area is covered by your system?

6. Is the system used in conjunction with other media?

7. What type of organization is yours: college, university, community college, business, vocational or technical school, other? Do you offer courses for credit?

8. What equipment are you currently using? What do you think about the quality of information available on teleconferencing equipment? Is this information easily attainable?

9. What kind of training (if any) is available to those who would like to use your teleconferencing system?

10. In what branch of your organization is the system located? (for example, is the medium used for continuing education or extended learning exclusively? Is it used by a variety of academic departments to deliver regular courses?)

2/22/78

EXXON SURVEY

Questions for Follow-up Calls

1. Descriptions of faculty:
    a. Age
    b. Seniority
    c. Are there any prerequisites for participation of faculty?
2. Are there other examples of noninstructional uses or applications?
    a. Student services
    b. Interorganizational communication
    c. Administration
    d. Others
3. Enrollment figures:
    a. Yearly since the start of the system, if possible
4. Total investment per year in teleconferencing:
    a. Comparison to remainder of the institution's budget (at least proportions or trends)?
5. Description of students:
    a. Age
    b. Sex
    c. Major
    d. Graduate/undergraduate/continuing education

Glossary

Amplified telephone: The general term for a "hands-free" telephone, using a loudspeaker and microphone unit rather than a telephone handset.

Audio teleconferencing: Group voice communication relying on exchanges among more than two participants via voice. Sometimes "audio" teleconferencing is defined as also including a capability to send writing or page copies over a normal telephone line. Such an expanded version of audio teleconferencing would more accurately be referred to as "audio plus graphics."

Bandwidth: The distance between the lowest and highest frequencies that can be sent over a given transmission facility. Wider ranges (e.g., 6 million cycles per second--the bandwidth of a TV channel) are called "broadband." Video teleconferencing is a broadband medium. Narrow ranges (e.g., 3,000 cycles per second--the bandwidth of telephone voice transmission) are called "narrowband." Audio teleconferencing is narrowband communication. Thus, bandwidth is the size of the signal carrier needed to send particular types of messages. More bandwidth means more cost for transmission, although the cost of bandwidth may be decreased eventually through the use of such technologies as satellites or optic fibers.

Bridge: A term used to describe the linking of three or more lines, usually via telephone circuits as in a conference telephone call.

Broadcast: One-way transmission of information.

Cable television: A transmission system that distributes broadcast television signals, original programs, and other services by means of a coaxial cable. Most cable systems also have the potential for two-way communication (rather than just TV broadcast) though this capability has been used infrequently.

Closed-circuit microwave: A private system for transmitting television signals, such as in a university TV network.

Common carriers: An organization (such as telephone operating companies) that provides communication services to the general public at nondiscriminatory rates, without control of message content.

Computer conferencing: Group communication through a computer. Such "conferences" may involve simultaneous communication or "asynchronous" meetings that allow participants to enter the conference at random times. Computer conferencing systems are normally not complicated to use and should not require special computer expertise. Some systems provide a hard copy of the conference.

Darome Convener: Darome is a brand name; Convener is the name of a popular audio teleconferencing set developed by the company. The Convener has portable speakers and table microphones with buttons to be pushed when a participant wishes to speak.

Dedicated system: Special transmission circuits devoted to a specific application. Such "dedicated" systems usually provide higher quality service than using public networks, but they are also more costly unless a high volume of usage is involved.

Electronic blackboard: A system for sending writing over a normal telephone line. As the sender writes on a normal-looking chalkboard, the writing appears in the remote location on a television monitor. Interaction is

possible when outlying locations have an electronic blackboard as well as a monitor. The Bell System is now marketing an electronic blackboard system called Gemini II in parts of the United States.

Facsimile or "fax": A telecopying device that sends page copies over a telephone line to a terminal at a remote location. Various speeds of transmission are used; systems using faster speeds (e.g., one minute per copy) are usually more expensive.

Four-wire circuit: A four-wire circuit usually avoids some of the electrical echo problems associated with the normal (i.e., "two-wire") telephone network. A four-wire circuit allows two locations to talk and be heard simultaneously, thereby giving a greater sense of presence.

Hybrid: As used in this report, a combination of two or more telecommunications devices.

Interactive media: Telecommunications systems that allow direct exchanges among people via one or more communication channels (e.g., voice, writing, or visual). Interactive media are used in this report to describe systems that allow a high degree of interpersonal communication.

Narrowband: See Bandwidth.

50-A Portable Conference Telephone: One of the most common audio teleconferencing devices in the United States today--a specific make of amplified telephone developed by Western Electric and distributed by the Bell System.

Slow-scan television: System for exchanging still images, displayed in television monitors. "Slow scan" means that the image is not constantly updated, as in a normal television system. Removing the

requirement to provide full moving images means that narrowband transmission (often a normal telephone line) can be used for transmission, with a dramatic reduction in cost over full video teleconferencing.

Speakerphone: An amplified telephone, allowing "hands-free" usage. Speakerphone is often the shorthand designation for the Western Electric 4-A.

Telecopier: See Facsimile.

Transmission line: The means by which a signal is sent and received. Actually, transmission "line" is sometimes used to refer to a satellite or microwave link.

Two-wire circuit: A typical telephone transmission circuit. In some applications, a two-wire system is less preferable than a "four-wire" because it requires voice switching to avoid electrical echo and leakage. See "Four-wire."

Victor Electrowriter: One of the early systems for sending writing over a telephone line; Victor is the manufacturer. The sender writes on a special pad, and the receiver sees the writing appear on a projection screen. Electrowriter is also sometimes used as a general term to describe systems for sending written information over electronic circuits.

Video teleconferencing: Audio plus full visual conferencing for a group of people. Typically, such systems provide room-to-room linkages, with live television (sometimes in color) and voice communication. Video teleconferencing is currently being tested in the United States, Japan, Australia, the United Kingdom, and other countries. Educational applications have been rare, primarily because of the high costs involved.

Voice-grade line: The bandwidth used for normal voice transmission (e.g., over a telephone network).

Voice switching: Electrical technique for opening an audio circuit only to the person who is currently speaking. Such a system only allows one person to speak at a time, often without the capability to interrupt. For instance, a person telling a joke from one location would not be able to hear if the participants at other locations were laughing. Voice switching is an effective technique for avoiding specific acoustical and electrical problems that are often associated with audio teleconferencing, but it has often been criticized by users.

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